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ZILLIG (H.). **Praktische Ergebnisse phänologischer Beobachtungen am Moselriesling (Vitis vinifera) und seinen Feinden.** [The practical results of phenological observations on the Moselle Riesling (*Vitis vinifera*) and its enemies.]—*Wein u. Rebe*, xxii, pp. 193–212, 1940. [Abs. in *Chem. Zbl.*, cxi (ii), 22, p. 3092, 1940.]

Systematic observations covering a period of 28 years on Riesling vines in the valley of the Moselle have led the writer to the following conclusions. Since the new foliage is often formed as early as the second half of April, the overwintered leaves, harbouring *Peronospora* [*Plasmopara viticola*], 'roter Brenner' [*Pseudopeziza tracheiphila*], and other pathogens, should be dug under by the middle of the month at the latest. Post-blossom treatments against *Plasmopara viticola* should be initiated during the first three weeks of July, following the cessation of flowering at the close of June or early July. Infection by *Oidium* [*Uncinula necator*] appears from 20th May onwards, while the middle of the same month is the earliest date for an outbreak of downy mildew. Prophylactic treatments should be planned accordingly.

McDOUGALL (J. C.). **Report of the working of the Department of Agriculture in the Central Provinces and Berar for the year ending 31st March, 1940.**—30 pp., 1941.

In the section of this report [cf. *R.A.M.*, xviii, p. 372] dealing with mycology (pp. 9–10), it is stated that two years' experiments have demonstrated that while exposure of juar [sorghum] seed to the summer sun helps appreciably to control grain smut [*Sphacelotheca sorghi*], it does not dispense with the necessity for the fungicidal dusting of infected seed. The evidence obtained indicated that the spores of the head smut form (*Sorosporium reilianum*) do not long remain viable in infected soil. Potted soil inoculated with the fungus in 1937 gave 37 per cent. infected heads; in 1938 the figure was reduced to 3, and in 1939 all the cobs were healthy. Field experiments gave less conclusive results, but even in these the incidence of smutted heads declined.

Three years' experiments on wheat loose smut (*Ustilago tritici*) demonstrated that the summer temperature in Nagpur is not sufficiently high, as it is in the Punjab, to kill the dormant mycelium in the seed, but that soil conditions at sowing time are such as to retard the

development of the dormant mycelium in the seed and the infection of the seedling.

The spraying of ground nuts against 'tikka' disease [*Cercospora personata*: ibid., xviii, p. 373] with Bordeaux mixture and added linseed oil gave considerable increases in yield, even in crops not contracting the disease.

Citrus pink disease (*Corticium salmonicolor*) causes progressively greater damage every year. The mycelium remains dormant in the cankers and becomes active when moist conditions prevail. The systematic removal of all diseased branches is essential, and spraying with Bordeaux mixture reduces further infection. Mango and jackfruit [*Artocarpus integrifolia*] are sources of infection.

The predominant fungus isolated from 'black blotch' lesions on sann-hemp [*Crotalaria juncea*] was *Fusarium* sp. This organism and others isolated from the dead parts of the bark failed, however, to infect healthy tissues, and blackening of the bark is primarily attributed to the action of water; the fungi infect the tissues through the blackened areas and destroy the fibres.

PARK (M.). **Report on the work of the Division of Plant Pathology.**—*Adm. Rep. actg Dir. Agric., Ceylon, 1939*, pp. D 20–D 22, 1941.

Apart from information noted from other sources the following items of interest occur in this report [cf. *R.A.M.*, xix, p. 260]. In one test, the Marglobe tomato variety gave 4,883 more plants affected by bacterial wilt [*Bacterium solanacearum*] per acre than a local variety produced from mass selections at Talatuoya and later at Peradeniya. The two varieties showed, respectively, 81·5 and 47·9 per cent. wilt. Roguing failed significantly to reduce the incidence of the disease. Further selection work is in progress.

The experimental campaigns against bunchy top of plantains [ibid., xx, p. 171] (which were concluded) indicated that incidence can be very considerably reduced, but complete eradication would be expensive and would take many years. Every effort should be made to persuade growers to undertake treatment themselves. Further eradication work was carried out at Minneriya and Tissamabarama; in localities such as these, where infection is not extensive and re-infection from outside sources unlikely, intensive eradication campaigns are valuable and may prove completely successful.

An exceptionally severe outbreak of sclerotial disease of rice, due to a strain of *Rhizoctonia* [*Corticium*] *solani*, occurred in one area.

In 1936, Surat ginger imported from India and planted in Ceylon became attacked by *Pythium myriotylum* [ibid., xvii, p. 294]. The ginger was destroyed, except in one small area, which was kept under close supervision. From these plants, a small quantity of clean ginger was established, which has remained unaffected for two seasons.

New disease records for Ceylon observed in 1939 included *Trichosporium vesiculosum* on *Casuarina equisetifolia*, *Ustulina zonata* on *Citrus aurantifolia*, *Diaporthe citri* on grapefruit, (?) *Uromyces sojae* on soy-bean, *Ovulariopsis moricola* on mulberry, *Coniothecium chomatosporum* on apple, and *Cercospora melongenae* on eggplant.

WIEHE (P. O.). **Division of plant pathology.**—*Rep. Dep. Agric. Mauritius, 1939*, pp. 10–14, 1941.

In this report on plant disease work in Mauritius in 1939 [cf. *R.A.M.*, xix, p. 261] the author states that inoculations of the spindles of young coco-nut palms with a suspension of *Bacterium vasculorum* [from sugar-cane] gave positive results. The first record of *Bact. albilineans* [cf. ibid., xix, p. 729] on SC 12/14 sugar-cane was made at Mon Désert sugar estate, Moka. Dry conditions early in the year strongly favoured sugar-cane smut (*Ustilago scitaminea*) [ibid., xix, p. 583] in low-lying districts, especially in the north and at Grand Port. The most severely affected cane was B.H. 10/12. Ratoon suffered more than virgin cane, and in some instances many stools succumbed. M. 171/30 was also affected in these localities. Three-months-old virgin D.K. 74, B.H. 10/12, and White Tanna canes were successfully inoculated in the field by injuring the roots with a knife and mixing broken-up infected heads with the soil, 73 per cent. of the stools being infected, while the controls remained healthy. In another experiment, farmyard manure was applied (*a*) in the interlines and (*b*) on the stool, and the plots averaged 36 and 12 per cent. infection, respectively.

Investigation of an outbreak of *Colletotrichum falcatum* [ibid., xviii, p. 344] on virgin M. 134/32 canes showed that in every instance the fungus had effected entry through borer galleries.

A study of the effect of potassic fertilizers on intensity of infection by *Helminthosporium ocellum* [*H. sacchari*: ibid., xi, p. 4; xii, p. 722] on B.H. 10/12 gave inconclusive results, 9·1 per cent. of the area of the third leaf being infected in the treated plot and 9·7 per cent. in the controls. A similar experiment with complete fertilizers, potash being omitted, also gave inconclusive results.

A comparative study of root failure on P.O.J. 2878 and D. 130 (a variety which was taken out of cultivation because of its susceptibility) showed that in both varieties destruction of the root system was induced by the same factors, viz., *Anguillulina similis* in combination with weak parasites including *Fusarium* spp., *Rhizoctonia* spp., and *Pythium* spp. [ibid., xix, p. 728].

A suspected outbreak of chlorotic streak [ibid., xix, pp. 237, 432; xx, p. 276] occurred on virgin B.H. 10/12 cane at Mon Désert and Mon Trésor sugar estate (Grand Port). A trial was later laid down to study the effect of hot water treatment on infected cuttings.

Wilt of *Calophyllum inophyllum* was caused by a fungus identified as a new species of *Haplographium*. Healthy trees experimentally inoculated developed symptoms of wilt in six weeks, and two weeks later were all dead. The fungus was reisolated from the affected wood, and in dead trees the entire sap wood was found to be completely permeated by hyphae. Positive results were also obtained from inoculations on *Mimusops maxima* and *Eugenia glomerata*, but the progress of infection was slow. Stem rot of *Calophyllum* [*inophyllum*] has so far been observed only in one locality. The cause was proved to be *Geotrichum candidum* [ibid., xvi, p. 575].

Wickstroemia indica in a number of districts was killed off by wilt due to *Phytophthora parasitica*.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, lii, 2, pp. 100–104, 4 figs., 1941.

Smut (*Ustilago zeae*) was first recorded on a commercial maize crop in Australia at George's Plains, near Bathurst, in May, 1938. The diseased crop was cut out by hand and carefully burned, and the owner of the property agreed to plant no more maize for a number of years. A year later, however, the disease was found on six other farms in the locality, and in 1940 on three more near Bathurst. Infection is at present confined to this district, and every possible effort is being made to prevent its introduction in the chief maize-growing areas of New South Wales. Maize is not an important crop at Bathurst, and its further cultivation locally is being discouraged. Action has also been taken to ensure that maize is not again grown on farms that have been affected.

Potato blackleg (*Erwinia phytophthora*) was first recorded in New South Wales in 1932, but was probably present many years before. It occurs in all the chief potato-growing areas of the State, and under warm, wet conditions may cause appreciable losses. The control measures recommended are as follows. Seed tubers should be taken from healthy plants, or, preferably, from crops in which the disease has not occurred. Any crop intended for seed purposes should be thoroughly rogued during the growing season for all diseases producing any symptoms on the above-ground parts. Rotation should be adopted, potatoes being planted only once every three or four years. All diseased plants and tubers should be burnt. The seed tubers should be treated before planting with acidulated mercuric chloride. When cutting tubers before planting, the knife should be disinfected if a diseased tuber is cut, and the tuber itself destroyed. During transit or storage the potatoes should be kept in cool, well-ventilated conditions.

GARDNER (M. W.). **Alfalfa, Sugar Beet, and Tomato diseases observed in Mexico.**—*Plant Dis. Reptr*, xxv, 3, p. 99, 1941. [Mimeographed.]

Early in January, 1941, N. Stahler detected the presence of *Pseudopeziza medicaginis* and *Peronospora trifoliorum* on lucerne, *Uromyces betae* on sugar beet, and *Bacterium vesicatorium* on tomato in various localities in Mexico.

COCHRAN (L. C.). **A case of the crown gall organism persistent in grain land.**—*Plant Dis. Reptr*, xxv, 2, p. 73, 1941. [Mimeographed.]

Circumstantial evidence is adduced for the infection by way of the soil of seedling and transplanted *Prunus* nursery trees by crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) on a site near the Citrus Experiment Station, Riverside, California, that had been alternately summer-fallowed and used for grain crops for upwards of 40 years.

MEHTA (K. C.). **Further studies on cereal rusts in India.**—*Sci. Monogr. Coun. agric. Res. India*, 14, vii+224 pp., 12 pl., 4 maps, 3 diags., 1940.

The results of the writer's further intensive studies on the cereal rusts of India [*R.A.M.*, xviii, p. 511] are fully described and tabulated. Besides the four physiologic races of *P. graminis tritici* already reported (15, 40, 42 [given in error as 41 in *R.A.M.*, xii, p. 500], and 75), two

more have been found since 1933, namely, 21 and 24, of which the former has been encountered only once and the latter is somewhat rare. Out of 586 collections investigated during the period covered by the present instalment, 163 were mixtures of two or more races. Race 42 is the most prevalent of the six under observation and 15 the most virulent. *P. g. avenae* was detected for the first time in the country in the course of the current survey, the Nilgiri hills being apparently the only area yet involved. The ten collections examined consisted of races 3, 4, 6, and 7. The six races of *P. triticina* found up to the present in India are 10, 20, 63, A, B, and C, of which the three last-named have not been reported from any other country and are stated in a footnote to have been assigned international numbers 106, 107, and 108, respectively: 63 predominates, followed by 20 (the most virulent), 10 is fairly common, 107 rare, while 106 and 108 were identified only thrice and twice, respectively. Out of 408 collections of the rust analysed, 117 were mixtures of two or more races. The four last-named of the following eight races of *P. glumarum* derived from 236 collections are new: 13, 19, 20, 31, A, D, E, and F; all were taken from wheat, except 19, which was obtained from barley. Races A and 19 are fairly widely distributed, followed in order of prevalence by 31, the remainder being of more or or less restricted distribution. Out of 236 collections examined, 45 were ascertained to be mixtures of two races each. All the physiologic races found on wheat were proved to be capable of attacking Fong Tien barley while race 19 was pathogenic to wheat. *P. g. secalis* has not hitherto been encountered in India, but *P. g. tritici* is weakly parasitic on rye.

Berberis and *Thalictrum* spp., the alternate hosts of *P. graminis* and *P. triticina*, respectively, are confined to the hills. In addition to *B. vulgaris*, which was used as a control in inoculation experiments but does not occur naturally in India, the following common indigenous species were infected: *B. lycium* (mild to severe), *B. aristata* and *B. coriaria* (leaves up to the age of three days only), *B. petiolaris*, and *B.* (?) *umbellata*, the two last-named being highly resistant. As regards the relation of barberries to the infection of wheat by *P. graminis tritici*, there is no case on record or any evidence available of an outbreak of black rust originating from this source. Unlike the conditions in temperate climates teleutospores represent the summer stage of the parasite. Normally germinable teleutospores are scarce from crops over the greater part of the area under wheat and barley, even in the hills, owing to their formation in or subsequent exposure to the high temperatures of April to June. The disease has been observed to develop year after year in the plains as early as December or January, i.e., three to four months before the earliest possibility of barberry infection in the hills. The local infection of barberries in the hills therefore cannot possibly constitute a sufficient source of epidemics in the plains to warrant the immense cost of their eradication, notwithstanding which outbreaks of the rust would continue unabated through the agency of uredospores over-summering in the hills. The restricted number of races of the rust found in India indicates that infection of barberries is not of frequent occurrence. Moreover, such teleutospore infection of barberries as may occur in elevated positions during the early part of the monsoon (June

to July) is unlikely to have much importance for the wheat and barley crops that are ready for harvest by that time.

In inoculation experiments with *P. triticina* on *T.* spp., the two native species, *T. javanicum* and *T. foliosum*, in addition to the highly susceptible *T. flavum* (of foreign origin), were attacked, the first-named only weakly. Two other foreign species, *T. delawayi* and *T. minus*, and the indigenous *T. neurocarpum* reacted merely by spermogonial production. The considerations set forth above regarding the relation of barberries to black rust are similarly applicable to that of *Thalictrum* to the spread of brown rust on wheat, which is effected primarily through the agency of uredospores persisting over summer in the hills. These organs have been found to be capable of surviving both the summer and winter at altitudes of nearly 7,000 ft. in the case of all three wheat rusts.

Pending the development of one or more wheat varieties able to withstand the attacks of *P. g. tritici*, *P. triticina*, and *P. glumarum*, the following methods of minimizing the immense losses, averaging Rs. 60,000,000 [£4,500,000] or so per annum, from rust epidemics are suggested: rigorous destruction of self-sown plants and tillers, on which the organisms are perpetuated, a month or two before sowing in the hills; in respect of Peninsular India, suspension of the first (April to June) wheat and barley crops (about 3,400 acres) in the Nilgiri and Palni hills (the source of inoculum for crops covering over 2,000,000 acres for wheat alone in the Hyderabad State and a considerable part of Bombay-Deccan), and postponement to a later date of the wheat crop normally sown in July or August in the Chitaldroog and Bellary districts; and with regard to the Indo-Gangetic plain, the largest tract under wheat cultivation, the prohibition of wheat and barley sowings during August and September in Nepal, where delay until October or November should reduce the amount of inoculum in this very dangerous focus of infection.

STRAIB (W.). **Über die Wirkung organischer Verbindungen als Spritzmittel gegen Rostpilzinfektion.** [On the action of organic compounds as sprays against rust fungus infection.]—*Zbl. Bakt.*, Abt. 2, ciii, 6–8, pp. 74–80, 1941.

In greenhouse experiments at the Gliesmarode (Brunswick) branch of the Biological Institute on the internal therapeutic control of cereal rusts (*Puccinia* spp.), flax rust (*Melampsora lini*), and *P. antirrhini* by spraying the seedlings shortly before, immediately after, or some days after inoculation with picric acid, ortho- and para-toluolsulphonamide [*R.A.M.*, xix, p. 464], acridin, and 0·2 per cent. borax, the first-named proved to be the most effective of the substances tested for the end in view. As a result of preliminary germination tests with uredospores, evidence is adduced pointing to the acidity of picric acid as the determining factor in its toxicity to the fungi under investigation, but the fungicidal effects of ortho- and para-toluolsulphonamide and acridin, which were exerted independently of the hydrogen-ion concentration of the medium, evidently rest on some specific inherent attributes of the substances in question. Picric acid and acridin (both at 0·1 per cent.) destroyed all the cereal rust spores in 24 hours at 20° and 14°, whereas 0·4 per cent. para-toluolsulphonamide was completely effective only

against *P. glumarum tritici*, and 0·2 per cent. borax permitted 20 per cent. germination of *P. anomala*.

Spraying with 0·1 per cent. picric acid immediately after inoculation gave absolute control of *P. g. tritici* race 7, *P. graminis tritici* strain X–20, and *P. triticina* race 11 on Michigan Amber wheat, of *P. secalina* on Petkus rye, and of *P. anomala* on Fong Tien barley, while semi-complete elimination of rust pustules was also effected by the same means with *P. coronata*. Applications two or four days after inoculation were less successful. Para-toluolsulphonamide (0·4 per cent.), when applied immediately after inoculation, was completely toxic to *P. triticina* and reduced infection by *P. secalina* to a minimum, *P. g. tritici* and *P. secalina* also being effectively combated by 0·4 per cent. ortho-toluolsulphonamide. *P. glumarum tritici* and *P. secalina* yielded to treatment with 0·4 per cent. acridin, which was also moderately successful against *P. graminis tritici*, *P. triticina*, and *P. coronata*.

Both the sulphonamides and acridin tended to injure the foliage of the treated plants at fungicidal concentrations, while picric acid, though generally less harmful in this respect, may severely damage certain plants, e.g., *Antirrhinum majus*.

Hassebrauk [ibid., xix, p. 464] failed to secure control of the cereal rusts by internal therapy in his field experiments with picric acid and the sulphonamides, and it is as yet impossible, on the basis of the present greenhouse trials, to forecast the commercial possibilities of spraying with these compounds. The method would not in any case be practicable with cereal rusts, but might come into consideration with crops like asparagus [against *P. asparagi*] as a substitute for Bordeaux treatments. The utility of the toluolsulphonamides, however, must necessarily be limited by their unfavourable chemotherapeutical indices as well as by considerations of expense, while picric acid has the further drawbacks of toxicity and risk of explosion.

McFadden (E. S.). **Stem rust is now migrating to the sunny south to spend the winter months.**—*Plant Dis. Reptr*, xxv, 1, pp. 24–25, 1941. [Mimeographed.]

Spore traps exposed at College Station, Texas, on 26th September, 1940, following three days of persistent northerly winds, registered a fall of 36,000 stem rust [*Puccinia graminis*] spores per sq. ft. in the six-hour period between 9 a.m. and 3 p.m., at least 6 per cent. of which were viable. Circumstantial evidence pointed to the origin of the inoculum on volunteer plants in the region north from north-central Oklahoma as far as the Brookings district of South Dakota, and St. Paul, Minnesota. The widespread development of *P. graminis* in the Southern Great Plains during the autumn is hazardous in respect of the 1941 small grain crops, the rust being normally capable of surviving the winter at least as far north as the southern slope of the Edwards Plateau near San Antonio, Texas [*R.A.M.*, xix, p. 463].

Gorter (G. J. M. A.). **Eye-spot lodging disease of Wheat.**—*Fmg S. Afr.*, xvi, 180, pp. 81, 110, 1 fig., 1941.

A popular account is given of eye spot of cereals (*Cercosporella herpotrichoides*), which has been observed of recent years in experimental

wheat plots in the Caledon district of South Africa, where the fungus was previously recorded by L. Verwoerd on the same host in two other localities in 1936 and on oats at Elsenburg in 1933. Investigations on the disease in other grain-producing countries have shown it to be confined to regions with an annual rainfall of 14 to 24 in. Indirect control measures, based on rational methods of cultivation, are briefly indicated, and include shallow, comparatively sparse, and reasonably late sowing (having regard to the desirability of early sowing to avoid rust [*Puccinia* spp.]), rotation with lucerne, soil enrichment with phosphates and nitrogen, and the use of strong-strawed varieties capable of resistance to lodging.

TAPKE (V. F.). **A technique for identifying the loose smuts of Barley.**—*Phytopathology*, xxxi, 3, pp. 284–286, 1 fig., 1941.

The following method has been found both rapid and satisfactory for the differentiation of the two loose smuts of barley, *Ustilago nuda* and *U. nigra* [*R.A.M.*, xv, p. 211]. A suspension of spores from loose smut heads is poured over the surface of potato dextrose agar in a Petri dish and allowed to stand until the spores adhere to the agar, whereupon the water is poured off and all excess moisture removed. After 12 to 18 hours at 65° to 70° F. the cultures are usually ready for examination. Under these conditions germination of *U. nuda* is effected only by the production of branching hyphae, while *U. nigra* puts out a short promycelium giving rise later to four sporidia which multiply rapidly by yeast-like budding. The spores of *U. nuda* are usually relatively short-lived, and specimens are held for later identification at 34° to 38° at which temperature the viability of both smuts is appreciably prolonged. The spores of *U. nuda* and *U. nigra* are readily distinguishable from those of *U. hordei* by their echinulate membranes.

ZNAMENSKAYA (Mme. M. N.). **Chemical and thermal methods for treating Barley seeds as a control measure against helminthosporiosis.**—*Bull. Pl. Prot. Leningr., 1940*, 1–2, pp. 254–259, 1940. [Russian. Abs. in *Chem. Abstr.*, xxxv, 7, p. 2265, 1941.]

The best experimental control of *Helminthosporium gramineum* on barley was obtained by seed treatment with granosan (1 gm. per kg.) or by ten minutes' immersion in 1 in 400 NIUIF No. 1 [*R.A.M.*, xix, p. 435]. Other successful treatments were 15 to 30 minutes in 0·125 to 0·25 per cent. germisan and 30 minutes in 0·1 per cent. mercuric chloride or 0·2 per cent. mercurized aniline. Disinfection may be carried out a month or two before sowing.

RADEMACHER (B.). **Über die Veränderungen des Kupfergehaltes, den Verlauf der Kupferaufnahme und den Kupferentzug beim Hafer.** [On the alterations in the copper content, the course of copper assimilation, and the withdrawal of copper in Oats.]—*Bodenk. u. PflErnähr.*, N.F., xix, pp. 80–107, 1940. [Abs. in *Chem. Zbl.*, cxi (ii), 16, p. 2202, 1940.]

The critical period for the supply of copper to oats is in the early stages of growth preceding panicle formation; if this is allowed to pass without the necessary attention, disturbances will result which cannot

be counteracted by subsequent treatments. Although the actual copper requirements of the plant are very modest, the element must be introduced in substantial quantities into 'sick' soil [i.e., soil inducing reclamation disease: *R.A.M.*, xviii, p. 667], since a large proportion becomes fixed and cannot be utilized during the first year after application; in one moorland soil, for instance, only 34·75 gm. of the 25 kg. per ha. given (0·14 per cent.) was recovered from the harvested plants.

MULDER (G.). **Copper deficiency as a cause of 'breaking in new land' disease.**—*Z. PflKrankh.*, l, pp. 230–272, 1940. [German. Abs. in *Chem. Abstr.*, xxxv, 7, p. 2260, 1941.]

Cereals grown in copper-deficient water and sand cultures developed within three weeks symptoms identical with those of reclamation disease [*R.A.M.*, xviii, p. 613]. An addition of 50 γ to each 1 l. container sufficed to produce normal plants in the water cultures, whereas considerably larger amounts were required for the soils, in the particles of which the copper became fixed in such a way that only a small proportion was available for the roots [see preceding abstract]. Very susceptible crops (wheat, oats, and barley) needed significantly larger quantities of copper than the comparatively resistant rye and potatoes. The outcome of tests conducted by a modified Neubauer method and a microbiological technique clearly demonstrated a correlation between the amount of available copper in the soils and the development of pathological symptoms. Moreover, the seeds of normal plants contained more copper than those of affected ones. The copper immobilized in 'diseased' soils, partly by certain humus substances as well as through the agency of hydrogen sulphide-producing bacteria, may be made available to the plants by treating the soils with steam, alcohol, or acetone, while manuring with ammonium sulphate in preference to sodium nitrate is also beneficial, likewise an improved tilth.

Although the incorporation of copper sulphate into alkaline, copper-deficient soils is effective against reclamation disease, at the same time it tends to induce the 'grey speck' symptoms of manganese deficiency. Since the immobilization of manganese is due to oxidation by a micro-organism catalysed in agar cultures by small quantities of copper, it is probable that the introduction of the latter into field soils is followed by an enhanced microbiological fixation of manganese. Copper-deficient wheat plants have been found to be more susceptible to head diseases than normal ones.

LING (L.). **The histology of infection of susceptible and resistant selfed lines of Rye by the Rye smut fungus, Urocystis occulta.**—*Phytopathology*, xxx, 11, pp. 927–935, 3 figs., 1 diag., 1940.

Studies were carried out at Minnesota to determine the mode of penetration and mycelial development of flag smut (*Urocystis occulta*) in four selfed lines of rye supplied by the University Farm, namely, the very susceptible C–51, the susceptible C–26, and the resistant C–28 and C–37, which were inoculated with chlamydospores of the smut at 15° C. [*R.A.M.*, xix, p. 652].

During the first six days after seed germination no consistent differences could be detected in the reactions of the several lines to invasion

by the fungus, which was effected with equal facility in the resistant and susceptible selections. However, in the resistant lines the ready penetration of the infection hyphae was followed by an almost complete arrest of further mycelial development. Scattered hyphal segments are found in the outer layers of the coleoptile and first leaf, but the mycelium does not spread to the meristematic region of resistant lines, whereas at 28 days of age that of susceptible seedlings becomes permeated from the coleoptilar internode, which is reached a week earlier.

The actual process of penetration of epidermal cell wall of the coleoptile by the binucleate infection hyphae appears to be partly of a mechanical and partly of a chemical nature; it may or may not be accompanied by extensive softening and thickening of the cell wall, and by constriction of the hyphal tips at the site of entry into a host cell.

Attention is drawn to the similarity of *U. occulta*, *Tilletia tritici* [*T. caries*], and *Ustilago avenae* in respect of the uniformity of their behaviour in resistant and susceptible hosts in the initial stages of attack [ibid., x, p. 18; xv, p. 711].

JOHANN (HELEN). **Occurrence of scolecospore-producing strains of Diplodia zeae in the United States.**—*Phytopathology*, xxx, 11, pp. 979–981, 1 fig., 1940.

Since the writer's previous report on the occurrence of scolecospores in a strain of *Diplodia zeae* isolated in 1934 from a decayed maize kernel in Ohio [*R.A.M.*, xviii, p. 307], surveys based on diseased material collected by Hoppe from the 1938 crop denote that such strains are widely distributed in 14 maize-growing states of the American Union. The scolecospores were derived from potato dextrose agar cultures of infected kernels, surface-sterilized with BK, incubated in the laboratory until the surface of the agar became covered with hyphae, when they were transferred to a moist chamber for three to ten weeks. The ivory- to tan-coloured scolecospore masses emerged in the form of droplets or horns and were usually first observed near the distal end of the kernels among the pycnidia discharging the typical brown spores of the fungus, often occurring in profusion on the kernel sides and crown. The pycnidia containing each of the two spore types were very similar, superficial or more or less deeply embedded in the kernel, massed or solitary. The colonies developing from the scolecospores in agar cultures resembled those produced by the ordinary brown pycnospores and in due course gave rise to fructifications of the latter type.

MEI CHERS (L. E.) & LOWE (A. E.). **The reaction of Sorghum varieties and hybrids to Milo disease.**—*Plant Dis. Reptr Suppl.* 126, pp. 165–175, 1940. [Mimeographed.]

Tables are given showing the reaction to milo disease (*Pythium*) [*arrhenomanes*: *R.A.M.*, xix, p. 13] of the sorghum varieties and hybrids tested at two Kansas experiment stations from 1930 to 1939. The numbers placed in the susceptible, segregating, and resistant groups as a result of these trials are 66, 13, and 210, respectively. Generally speaking, most of the milos and many of the milo and darso hybrids tend to be susceptible or segregating, while varieties of feterita, sorgo, kafir, Sudan grass, durra, and broom corn [*Sorghum bicolor* var. *technicus*] fall into the resistant class.

Laskaris (T.). **A heritable lysis in germinating chlamydospores of Sphacelotheca sorghi.**—*Phytopathology*, xxxi, 3, pp. 254–263, 2 figs., 1941.

In the course of studies on the genetics of covered kernel smut of sorghum (*Sphacelotheca sorghi*), an abnormality of germination [cf. *R.A.M.*, xii, p. 89] in the form of promycelial lysis before or after the production of sporidia was observed in the monosporidial crosses 22A3 × 122B3, 22A4 × 122B2, 122F2, 22A1 × 22A4, 150, 152, and 154, the incidence of the phenomenon ranging from 20 per cent. in 122F2 and 22A1 × 22A4 to 90 per cent. in 22A3 × 122B3. In the last-named cross promycelia may reach 200 μ in length before disintegrating and frequently no sporidia are formed, though abortive sporidia are not uncommon. One or more genetic factors would appear to be involved in the predisposition to lysis, since it has persisted through two chlamydospore generations and is typical of only certain combinations of lines. The mean lengths and widths of the promycelia produced by the lethal crosses (i.e., those showing considerable lysis) on potato dextrose agar were 20·6 to 71·4 by 2·9 to 4·4 μ compared with the normal dimensions of 18·2 to 24·4 by 2·8 to 2·9; the abnormal primary sporidia ranged from 9·6 to 18·9 μ in length as against 9·7 to 10·8 μ for standard specimens; and finally, the mean chlamydospore diameter of lytic and non-lytic lines ranged from 6·1 to 7·1 and from 6·1 to 6·9 μ, respectively. Experimental evidence failed to disclose any necessary connexion between solopathogenicity (Christensen's term for the capacity of monosporidial lines of *Ustilago zeae* to cause infection and form chlamydospores when inoculated into the host alone [ibid., xi, p. 363]) and the lytic tendency in *S. sorghi*.

Turrell (F. M.) & Klotz (L. J.). **Density of stomata and oil glands and the incidence of water spot in the rind of Washington Navel Orange.**—*Bot. Gaz.*, ci, 4, pp. 862–871, 8 figs., 1 graph, 1940.

The results of experiments carried out at the University of California Citrus Experiment Station at Riverside on water spot of the Navel Orange are given here in greater detail [cf. *R.A.M.*, xix, p. 144], and the conclusion is drawn that neither the density of the stomata nor that of the oil glands in the rind is related to the incidence of this disorder.

Singh (D.). **Withertip of Citrus plants.**—*Punjab Fruit J.*, iv, pp. 722–723, 1940. [Abs. in *Hort. Abstr.*, xi, 4, p. 39, 1941.]

Citrus withertip (*Colletotrichum gloeosporioides*) is stated to be controllable in the Punjab by spraying in February, April, and September with a mixture of 4 lb. each of copper and ferrous sulphates and 8 lb. lime in 50 gals. water.

Klotz (L. J.) & Fawcett (H. S.). **Brown rot and gummosis. Further studies of the fungi causing these diseases in Citrus trees and fruit.**—*Calif. Citrogr.*, xxvi, 5, pp. 114, 142–143, 2 figs., 1941.

The fungi causing citrus brown rot in California (*Phytophthora citrophthora*, *P. parasitica*) [and *P. hibernalis*, and other species: *R.A.M.*, xvii, p. 313; xviii, p. 450] are killed out during summer in the top 2 in. of soil, where the temperature reaches over 110° F. They persist farther

down, however, as vegetative hyphae and resting spores. When the rains set in during autumn, the spores germinate and the hyphae rapidly spread to the surface where the fungi form sporangia liberating zoospores into the rain water, in which they are splashed on to the fruit. Protection is afforded by an application of Bordeaux mixture just before or after the first rain.

In the last six years spraying tests were carried out with 800 different formulae, but no better material than Bordeaux could be found, though the admixture of zinc sulphate is desirable if fumigation is to be carried out before the passage of a rainy season. Protection against brown rot is afforded by a spray consisting of 1 lb. copper sulphate with 1 lb. hydrated lime, as well as by one consisting of 5 lb. zinc sulphate, 1 lb. copper sulphate, and 4 lb. lime.

When the fruits of 90 species, varieties, hybrids, and relatives of citrus were experimentally inoculated with *P. citrophthora* and *P. parasitica* only the small green lime varieties, such as those known as Mexican, Everglade, Key, and West Indian were resistant. In practice it has been found that the disease is most serious on lemons, followed in descending order of susceptibility by Navel oranges, Valencia oranges, and grapefruit.

On a Ramona soil type at Riverside Navel orange trees that were basin-irrigated had 62 times as many infected fruits as furrow-irrigated trees. Ammonium sulphate applied to basin-irrigated trees caused the water to stand on the soil for 24 to 72 hours, though in calcium nitrate-fertilized basins it stood only three hours, and in non-fertilized plots percolated through the soil almost at once. The average number of rotted fruits from the three plots, respectively, was 20·25, 2·25, and 1·5. Trees basin-irrigated every two weeks had 16 times as many infected fruits as those similarly irrigated every four. Basin irrigation, however, causes no appreciable increase of gummosis and brown rot on sandy, open soils. On the Ramona soil 11 out of 13 (84·6 per cent.) Navel orange trees (10 years old) that received 4 in. of water in a basin every two weeks developed gummosis, while only 4 out of 14 (28·6 per cent.) that received this amount every four weeks became affected. No furrow-irrigated trees were attacked.

Evidence was obtained that trees on sweet orange stock can be protected by planting only healthy trees, using only trees that are budded high, setting the young tree so that the first lateral roots are barely covered, and protecting the lower stems with a copper fungicide. In trees that have already become infected the disease is curable by surgical methods. The ideal method of control is, of course, to use immune varieties.

Cooper (H. P.). **Nutritional deficiency symptoms in Cotton.**—*Proc. Soil Sci. Soc. Amer.*, iv, pp. 322–324, 1939. [Abs. in *Chem. Abstr.*, xxxv, 1, p. 254, 1941.]

Potash and sulphur deficiency symptoms are observed in cotton during dry growing seasons, and those of manganese, magnesium, and nitrogen shortage in wet ones, especially if the fertilizers have contained large amounts of nitrates, sulphates, or chlorides. The percentage of red leaves on cotton (a magnesium deficiency symptom) [*R.A.M.*, xix,

p. 135] in a source of nitrogen test ranged from 28·3 per cent. for sodium nitrate to 1 per cent. for a mixture of ammonium sulphate and basic slag. Potash, manganese, iron, and boron deficiency symptoms may develop in plants grown in Coastal Plain soils manured with lime. Rapid growth and high yields may induce deficiency symptoms through the speedy exhaustion of soil nutrients, which remain available, on the other hand, to crops developing slowly and making restricted growth. Disease and root injuries are other factors contributing to deficiency disturbances. The symptoms of nitrogen, potash, phosphorus, and magnesium deficiency in cotton at various stages of growth are described.

Jordan (H. V.), Nelson (H. A.), & Adams (J. E.). **Relation of fertilizers, crop residues and tillage to yields of Cotton and incidence of root rot.**—*Proc. Soil Sci. Amer.*, iv, pp. 325–328, 1939. [Abs. in *Chem. Abstr.*, xxxv, 1, p. 259, 1941.]

The incidence of cotton root rot [*Phymatotrichum omnivorum*] was reduced on Wilson very fine sandy loam by nitrogenous fertilizers and increased by those containing phosphorus, the effects on heavier soils being less pronounced. On Houston soils the disease was combated by turning a second crop of sorghum or early turning of cotton stalks into the soil.

Adams (J. E.), Wilson (R. C.), Hessler (L. E.), & Ergle (D. R.). **Chemistry and growth of Cotton in relation to soil fertility and root rot.**—*Proc. Soil Sci. Soc. Amer.*, iv, pp. 329–332, 1939. [Abs. in *Chem. Abstr.*, xxxv, 1, p. 259, 1941.]

The nitrogen contents of cotton root bark and leaves was found to be negatively correlated with root rot [*Phymatotrichum omnivorum*], the reverse being the case in respect of phosphorus [see preceding abstract].

Petch (T.). **The entomogenous fungi of Mauritius.**—*Bull. Mauritius Inst.*, ii, 1, pp. 14–20, 1941.

This is a critically annotated list of over 40 entomogenous fungi of Mauritius, based almost entirely on collections made by R. Mamet since 1934. A Latin diagnosis is given of a new species, *Torrubiella blattae* Petch, collected by J. Vinson on the octheca of a Blattid, and characterized by gregarious, narrow flask-shaped to conoid, amber perithecia, darkening at the apex, white-tomentose below, glabrous above, 0·5 mm. in height, 0·25 mm. in diameter at the base, and by long-cylindrical asci, 3 μ in diameter, and linear, multiseptate ascospores, 0·75 μ in diameter. The specimen of *Beauveria densa* [*R.A.M.*, xviii, p. 676] collected on *Dieuches placidus* differed to such an extent from a subculture of the fungus originally introduced on to the Island for the purpose of combating *Phytalus smithi* that a new species was thought to be possibly involved. The subsequent comparison, however, of a number of cultures and subcultures of *B. densa* supplied by the Canadian Department of Agriculture revealed, not only the loss of pigmentation and pathogenicity already recognized in connexion with the propagation of this organism, but such far-reaching variations in morphological characters as to induce some hesitation in referring them to *Beauveria*. The specimens of *B. densa* collected are probably native examples of this cosmopolitan fungus.

Stifler (C. B.). **A new genus of Hypocreales.**—*Mycologia*, xxxiii, 1, pp. 82–86, 6 figs., 1941.

A fungus parasitic on termites was collected on dead insects in 1935 below Great Rift Wall, Lake Manyara, Tanganyika, by A. E. Emerson and sent to the author for identification. It is believed to be new to science and is named *Cordycepioideus bisporus*, Latin diagnoses being given for the new genus and species. The genus is characterized by erect, simple or branched, clavate stromata, producing perithecia immersed in the clavate head, the apex of which is sterile. Paraphyses are absent and the evanescent, clavate asci with long stipes each contain two broadly elliptic spores slightly flattened on one side.

Farness (O. J.). **Coccidioidal infection in a Dog.**—*J. Amer. vet. med. Ass.*, xcvii, 762, pp. 263–264, 2 figs., 1940.

Coccidioides immitis was isolated from the lungs, liver, spleen, and kidneys of a two-year-old female Great Dane at Tucson, Arizona, this being the first record of the fungus in a dog.

Semon (H. C. G.) & Moritz (A.). **An atlas of the commoner skin diseases.**—xii+272 pp., 120 col. pl., London, Simpkin Marshall Ltd., 1940. 42*s*.

A number of dermatomycoses are included in this compilation of the better-known skin diseases, illustrated by reproductions by direct colour photography from the living subjects and accompanied by concise observations on the symptoms, diagnosis, etiology, and therapy of the disorders under discussion.

Dangerfield (L. F.) & Gear (J.). **Sporotrichosis among miners on the Witwatersrand gold mines.**—*S. Afr. med. J.*, xv, 7, pp. 128–131, 2 figs., 1941.

Since 1938 68 cases of sporotrichosis (*Sporotrichum? beurmanni*) in native and six in European miners in the Witwatersrand gold mines have been under investigation [*R.A.M.*, vii, p. 240]. The clinical diagnosis was confirmed in all the European cases and in 16 of the natives by cultural examination at the South African Institute for Medical Research; in the other native patients the clinical picture was so characteristic as to leave no doubt regarding the cause. From the history of the cases it is clear that infection was contracted underground.

Elisei (F. G.). **Nuovo reperto e nuova interpretazione morfologica e sistematica di Malbranchea pulchella Sacc. et Penz, considerata come una nuova specie e un nuovo genere di dermatofiti.** [A new discovery and new morphological and systematic interpretation of *Malbranchea pulchella* Sacc. & Penz., regarded as a new species and a new genus of dermatophytes.]—*Atti Ist. bot. Univ. Pavia*, Ser. IVa, xii, pp. 141–200, 1940. [Abs. in *Zbl. Bakt.*, Abt. 2, ciii, 6–8, pp. 119–120, 1941.]

Latin diagnoses are given of the genus *Malbranchea* Sacc., 1882, emend. Elisei, 1940 [*R.A.M.*, xix, p. 409] (syn. *Thermoidium*), and of its type species *M. pulchella* Sacc. & Penz., 1882, emend. Elisei, 1940 (syn. *T. sulfureum*, *M. bolognesii-chiurcoi*, *M. kambayashii*).

Tomb (J. W.). **The treatment of black hairy tongue (lingua nigra).**—*J. trop. Med.* (*Hyg.*), xliii, 11, p. 155, 1940.

In connexion with a brief note on the therapy of black tongue in an ex-service man who had contracted the disease in India four years earlier, the writer states that this rare condition is due to *Cryptococcus linguae-pilosae* [*R.A.M.*, v, p. 301], and that *Rhizopus niger* and *Nocardia lingualis* [*Actinomyces guegueni*] have also been found associated with it.

Yegian (D.) & Kurung (J. M.). **Dextrose yeast extract medium for the isolation of fungi from sputum.**—*J. Lab. clin. Med.*, xxvi, 7, pp. 1195–1197, 2 figs., 1941.

The following medium has been found definitely superior to Sabouraud's agar (P_H 5·5) for the isolation in an uncontaminated condition of *Coccidioides immitis*, *Monilia* [*Candida*] *albicans*, and other species from the sputum of patients at the New York State Hospital for Incipient Pulmonary Tuberculosis: 8 gm. dextrose, 1·7 gm. sodium chloride, 0·5 gm. yeast extract (Difco), and distilled water to make up to 200 c.c., adjusted to P_H 4. In comparative tests with Sabouraud's agar at P_H 5·5 and 4, bacterial colonies developed in profusion on the former, to a lesser extent on the latter, and were altogether absent on dextrose-yeast extract medium.

Díaz (C. J.), Mendoza (H. C.), Lahoz (C.), Recatero (L.), & Canto (G.). **El alérgeno sensibilizante en el asma de los molineros.** [The sensitizing allergen in millers' asthma.]—*Rev. clín. esp., Madr.*, i, 1, pp. 53–54, 1940. [German and French summaries.]

The writers' observations on 'millers' asthma', stated to be very widespread in Spain, definitely point to the implication of the wheat bunts, *Tilletia tritici* [*T. caries*] and *T. levis* [*T. foetida*], in the causation of the trouble [cf. *R.A.M.*, xix, p. 706]. Positive reactions to spore extracts of the fungi were exhibited by all the patients tested, and passive transmission was effected in two cases. The mass inhalation of these spores in the mill is thought to be quite sufficient to account for the prevalence of the disease, the allergenic properties of the smutted grain being so powerful as to sensitize almost every individual exposed to contact with it.

Bryant (H. W.) & Hammer (B. W.). **Bacteriology of cheese. V. Defects of blue (Roquefort-Type) cheese.**—*Res. Bull. Ia agric. Exp. Sta.* 283, pp. 112–147, 10 figs., 1940.

Hormodendrum olivaceum [*R.A.M.*, xi, p. 646] was found to be responsible for a black discoloration and musty flavour in blue cheese from a commercial plant in Iowa, ingress being gained through the punch holes and cracks in the surface.

Rudakoff (K. I.), Harzstein (N. G.), & Shishelova (Mme N. A.). **Catenularia fuliginea als Erreger einiger Defekte bei der gezuckerten Kondensmilch.** [*Catenularia fuliginea* as the agent of some defects in sweetened condensed milk.]—*Microbiology*, ix, pp. 45–52, 1940. [Russian. Abs. in *Chem. Zbl.*, cxi (ii), 15, p. 2103, 1940.]

Catenularia fuliginea [regarded by van Luijk as a synonym of *Torula*

sacchari: *R.A.M.*, viii, p. 66; xiii, p. 701], was isolated at the Pan Russian Institute for Agricultural Microbiology, Moscow, from some 97 per cent. of condensed milk samples invaded by the chocolate-brown mould, which assumes the form of spots, clumps, 'buttons', and the like, of a brown, reddish, or yellowish colour and imparts to the milk an unpleasant cheesy taste and smell. The optimum temperature for the development of the mould ranges from 20° to 25° C., no growth occurring from −5° to +5° and little at 10° or 30°. *C. fuliginea* thrives in the presence of a saccharose content of 61 to 63 per cent. and is only slightly retarded at 65·5 per cent., whereas at these concentrations *Aspergillus* and *Penicillium* make little progress. The spores of *C. fuliginea* are destroyed by pasteurization. Contamination takes place from the atmosphere in the final phases of manufacture.

Colin-Russ (A.). **A contribution to the study and control of mould growth in leather and other materials.**—*J. int. Soc. Leath. Chem.*, xxiv, 12, pp. 395–408, 1 fig., 1 graph, 1940.

Liability to mould growth of a given material, e.g., leather, woven fabrics, or compressed fibres, being of a composite nature, is here resolved into fundamental ratios, methods for the direct determination of which are described. One of these ratios is known as mould weight per unit weight of associated moisture (the available moisture of the material required for mould growth), characteristic mustiness of odour being a frequent concomitant of an upper limit of 20 per cent. associated moisture in the conditioned leather weight. Among the 28 species of fungi recognized by leather technologists prior to 1918, since when the list does not appear to have been appreciably extended, may be mentioned *Mucor mucedo*, *M. racemosus*, *Botrytis cinerea* *Monilia* [*Sclerotinia*] *fructigena*, *Trichothecium roseum*, *Fusarium putrefaciens* Osterwalder, various *Saccharomyces* and *Torula* spp., *Aspergillus glaucus*, *A. niger*, *Verticillium glaucum*, *Cladosporium herbarum*, *Macrosporium cladosporioides*, *Alternaria tenuis*, and *Mycoderma tannica* Asai. In agreement with Orthmann and Higby in the United States, the author has also found *Aspergillus fumigatus* and *A. versicolor* [*R.A.M.*, ix, p. 316] on leather substrata, besides *Penicillium expansum*. The best of the 19 antiseptics tested against mould growth on leather included merfenil at a strength of only 0·00175 per cent. (May & Baker, Ltd.), alkaline β-naphthol (0·1 to 0·4 per cent.), and mercuric chloride (0·1, 0·4, or 1 per cent.), of which the first-named is of outstanding efficiency besides being economical.

Jones (L. K.). **Leaf curl and mosaic of Geranium.**—*Bull. Wash. St. agric. Exp. Sta.* 390, 19 pp., 7 figs., 1940.

A tabulated account is given of the writer's studies on geranium (*Pelargonium hortorum*) leaf curl and mosaic in Washington [*R.A.M.*, xvii, p. 684; xviii, p. 442, *et passim*]. Following a description of the symptoms of the diseases the author states that leaf curl is widely prevalent in greenhouses, where the incidence of infection may range from a trace to 45 per cent., the average in one Spokane glasshouse on 18 varieties on 8th May, 1937, 22nd April, 1938, and 23rd April, 1939, being 8, 16, and 6·3 per cent., respectively. The Fiat, Gloede, Michell,

and Viaud were the most severely infected varieties, while Variegated Nutt remained free from the disease, though shown by grafting experiments to be susceptible. Mosaic is also widespread, especially in the Seattle and Tacoma districts, but is less injurious than leaf curl; the Michell variety sustained the heaviest damage (up to 40 per cent.) among the seven under observation in 1938. Both viruses are readily transmissible by grafting from diseased to healthy plants, but not by mechanical inoculation to geranium, tobacco, or tomato, by the knife used in making cuttings, or through the seed. A low incidence of natural dissemination of both viruses was observed in the field, but no evidence has been secured of the implication of insects in this process. The development of leaf-curl symptoms was not influenced by temperature variations between 50° and 70° F., protracted daylight, or reductions in the available potash, nitrogen, or phosphorus supplies, but in 1938 plants watered with manure solution showed a marked improvement after a fortnight, which was still maintained a month after the treatment, a similar but less pronounced effect being exerted by Vigoro (1 lb. per 10 sq. ft.) and iron sulphate solution (1 in 100). The careful selection of symptomless plants, grown in the field during the summer for autumn propagation, resulted in a substantial reduction in the amount of leaf curl over a three-year period, while practically complete control of both diseases was obtained by the drastic roguing of affected plants from a bed of stock in the greenhouse.

Piester (E. A.). **Relative susceptibility of Rose varieties to black spot.**— *Plant Dis. Reptr*, xxiv, 23, pp. 478–480, 1940. [Mimeographed.]

Lists are given showing the degree of susceptibility of different rose varieties to *Diplocarpon rosae* [*R.A.M.*, xvii, p. 821]. The most resistant (foliage clean or nearly so) are Donald Prior, Henry Nevard, Lady Ursula, Miss America, Mrs. Charles Bell, Mrs. Wakefield Christie-Miller, Pink Dawn, and Susan Louise. The foliage of the last-named remains completely unaffected.

Tompkins (C. M.) & Hansen (H. N.). **Tulip-anthracnose.**—*J. agric. Res.*, lxii, 1, 3 figs., 1941.

This is a full account of the anthracnose of tulips in California caused by *Gloeosporium thumenii* f. *tulipae* n.f. [without a Latin diagnosis: *R.A.M.*, xx, p. 21], which is stated to produce conidia varying in size from 9·75 to 23·75 by 3·25 to 7·25 μ, but mostly about 15 by 5 μ, in well-defined acervuli from 0·2 to 1·5 mm. in diameter.

Linn (M. B.). **Cephalosporium leaf spot of two Aroids.**— *Phytopathology*, xxx, 11, pp. 968–972, 2 figs., 1940.

A technical description [in English only] is given of *Cephalosporium cinnamomeum* n.sp., the agent of circular to irregular, reddish-brown, yellow-bordered, necrotic lesions, up to 5 or 6 mm. in diameter, on the leaves of *Nephthytis afzelii* and *Syngonium podophyllum* var. *albolineatum* in a greenhouse on Staten Island, New York, and of occasional reddish-brown, elongated spots, 1 to 3 mm. in length, on the petioles. The fungus, which forms cinnamon-buff colonies on 2 per cent. potato dextrose-agar, is characterized by terminal and intercalary chlamydospores, 12

to 14 by 7 to 10 μ, erect or decumbent, simple and continuous or compound and septate conidiophores, 3·5 to 45 by 1·6 to 2·8 μ, producing in mucous heads, 8 to 18 μ in diameter, ovoid to short-cylindrical, non- or uniseptate conidia, 4·2 to 15 by 1·5 to 5·8 μ (from the erect conidiophores), as well as cylindrical, uni- to quadriseptate, up to 22·6 μ (from the decumbent). The minimum, optimum, and maximum temperatures for the development of the pathogen in culture were found to be 9°, 24° to 27°, and 30° C. Positive results were obtained in inoculation experiments on both the above-mentioned Araceae with portions of agar cultures or spore suspensions of *C. cinnamomeum*.

Brown (B. A.) & King (A.). **Soil conditions under which Alfalfa responded to boron.**—*Proc. Amer. Soil Sci. Soc.*, xxxv, 1, pp. 310–313, 1939. [Abs. in *Chem. Abstr.*, xxxv, 1, pp. 259–260, 1941.]

Boron deficiency symptoms were observed in lucerne in Connecticut for the first time in 1939 [*R.A.M.*, xix, p. 543; xx, p. 192]. The application of 20 lb. borax per acre reduced the incidence of yellows from 25 to 3 per cent., increased plant height and yields by 15 and 16 per cent., respectively, and raised the boron content of the foliage from 21 to 62 p.p.m. No further advantage was derived from the addition of manganese, calcium, or zinc to potash-borax or potash-superphosphate-borax treatments.

Smith (O. F.). **Stemphylium leaf spot of Red Clover and Alfalfa.**—*J. agric. Res.*, lxi, 12, pp. 831–846, 4 figs., 1940.

A fungus, identified as *Stemphylium botryosum* [*R.A.M.*, xviii, p. 141] with the perfect stage *Pleospora herbarum* [loc. cit.], is described as causing a disease of red clover (*Trifolium pratense*) and lucerne in Wisconsin. The disease attacks mainly the leaves, producing irregular, dark brown to black lesions often surrounded by a straw-coloured halo, but it may occasionally produce small, black, linear lesions on stems and petioles. The lesions on the leaves increase rapidly and coalesce, and the petioles sometimes break at the locus of infection. The fungus usually enters the leaf tissues through the stomata but may also penetrate directly between the epidermal cells, growing intercellularly and killing the host cells on its way. Conidiophores and conidia, which rarely develop in culture, are produced in abundance on leaf lesions in about five to eight days after inoculation. The pathogenicity of the fungus to both red clover and lucerne was proved by greenhouse inoculations, and the organism was reisolated from the lesions produced. Cultures of the fungus from red clover inoculated into a limited number of leguminous hosts produced slight infection on *Medicago arabica*, lucerne, *T. resupinatum*, and *Melilotus alba*, which last was also found to carry the fungus on or in the seeds. There appeared to be two physiologic races of *P. herbarum*. When a conidial suspension from diseased lucerne was inoculated into red clover and lucerne plants, leaves of lucerne were completely killed in about five to eight days whereas only slight infection appeared on red clover after 16 days; when, on the other hand, the two hosts were inoculated with a conidial suspension from red clover, leaves of red clover were killed after about five to seven days and only small lesions were produced on lucerne after 14 days. This physio-

logic specialization was further confirmed by results of inoculations with ascospores and perithecial fragments and by field observations.

P. denotata is thought to be synonymous with *P. herbarum*, the latter name being preferred in spite of the fact that the ascospores from red clover are a little longer than the measurements given by Saccardo for that species. The fungus on lucerne described by Tehon and Daniels [ibid., v, p. 232] as *Thyrospora sarcinaeforme* is identified, on the basis of materials supplied by L. R. Tehon, as *S. botryosum*. No specimen could be obtained of *Macrosporium medicaginis* Cugini either from Cugini or any Italian stations, but from the description of this organism given by Traverso it seems to be distinct from *S. botryosum* as well as from all the other fungi described on lucerne. Diseased seeds of red clover and lucerne received from Wageningen on the suggestion of Gentner yielded ascospore cultures apparently identical with those described by Gentner as *P. herbarum* with *M. sarciniforme* [ibid., xviii, p. 716] as a conidial stage; conidia obtained on leaf lesions were, however, very similar to those of *S. botryosum* and the conidial stage is therefore considered to be this species. An examination of a small portion of the material collected by Peck and named *M. meliloti* showed it to be quite distinct from the fungus under consideration and its spores to be very similar to those of *M. commune* [ibid., xviii, p. 757] from asparagus, the two fungi probably belonging to the same species of *Alternaria*. *P. lycopersici*, described by Ramsey [ibid., xiv, p. 799], is stated to be very similar in both the conidial and the perithecial stages to *P. herbarum*, but inoculations of both red clover and lucerne with a culture of *P. lycopersici* obtained from Ramsey gave no infection on lucerne and only a slight one on red clover, and it was less virulent than *P. herbarum* isolated from that host.

Johnson (H. W.), Rodenhiser (H. A.), & Lefebvre (C. L.). **Two types of fall Panicum smut.**—*J. agric. Res.*, lxi, 12, pp. 865–875, 6 figs., 1 graph, 1940.

The results of inoculation experiments with *Sorosporium syntherismae* on *Panicum dichotomiflorum*, conducted at the Arlington Experiment Farm, Virginia, in 1938, showed that after the inoculated seed had been incubated for 26 days at 5°, 10°, 15°, and 20° C. the percentages of plants developing smut were 70·9, 72·5, 53·3, and 22·2 respectively. In the course of these experiments one smutted plant was observed to have buff sori containing hyaline, smooth-walled, and almost spherical chlamydospores, while all the remaining 307 plants had the common black sori with brown, echinulate or minutely verrucose, and subspherical or somewhat polyhedral spores. There was very little difference in spore size of the two types. Single chlamydospore cultures of the buff smut were mycelial and quite stable, while those of the black smut were of the sporidial type with a pronounced tendency to sector. Both types grew slowly at 5°, had an optimum near 20°, and a maximum between 30° and 35°. In inoculation experiments in 1939 with both types of smut, the 68 smutted plants which resulted from inoculation of seed with chlamydospores of the buff smut all produced only buff sori, while the 240 smutted plants that resulted from inoculation of seed with chlamydospores of the black smut all produced only black sori.

It is concluded that the buff smut is a result of mutation in *S. syntherismae* and that the change may involve several genetic factors.

ANET (H.). **L'action du bore sur les végétaux et son rôle dans les maladies physiologiques ou de carence des arbres fruitiers.** [The effect of boron on plants and its significance in the physiological or deficiency diseases of fruit trees.]—*Rev. hort. vitic. Suisse rom.*, xiii, pp. 214–221, 1940. [Abs. in *Hort. Abstr.*, xi, 4, p. 17, 1941.]

A number of excellent photographs are stated to accompany a description of the effect of boron deficiency on fruit trees in Switzerland, amplified by an account of the author's own experiences in the rejuvenation of apparently dying apples and pears by the application of borax to the soil. Apple varieties subject to 'coulure' (premature shrivelling of the flowers) and fruit malformation were cured of this condition (of ten years' duration) by the incorporation of borax with the soil at the rate of 4 gm. per sq. m.

MEIER (K.). **Düngeversuche mit Obstbäumen. 6. Mitteilung. Ueber Kalimangelerscheinungen und die Wirkung der Kalidüngung auf kalibedürftigem Boden.** [Manuring experiments with fruit trees. Note 6. On potash-deficiency symptoms and the effect of potash manuring on potash-deficient soil.]—*Annu. agric. Suisse*, liv, 9, pp. 944–974, 1 col. pl., 6 figs., 5 graphs, 1940. [French summary.]

A detailed, fully tabulated account is given of experiments and analytical researches at the Wädenswil Federal Fruit-Growing Station to determine the relation between the established insufficiency of potash in the local soil and certain pathological manifestations in fruit-trees, notably apples (Cox's Orange Pippin) and apricots, including leaf scorch [*R.A.M.*, xiii, p. 40; xvii, p. 254], inadequate wood development, reduced blossom set and yields, and ultimate decline. The cause of the trouble appears to reside not only in a shortage of potash, phosphoric acid, and nitrogen, but also of boron [see preceding abstract]. Soil analyses have shown that a minimum of 4 to 5 mg. readily soluble potash per 100 gm. soil must be available in order to avoid injury to the trees. Xylem analyses were found to constitute a valuable adjunct to the studies, revealing an antagonism already observed by some English and German workers on the same lines, between potash on the one hand and lime, iron, magnesia (not convincingly demonstrated in these experiments), and phosphoric acid on the other. The condition under discussion being widespread in the Wädenswil district on currants [ibid., xiii, p. 173], gooseberries, and other plants, as well as on fruit-trees, attention is hereby drawn to the advisability of timely prophylactic measures. Potash may be economically applied in the form of wood ash in amounts to be determined by analyses of the special requirements of a given soil.

BAINES (R. C.). **Observations on the maturation of the ascospores of the Apple scab fungus in Indiana.**—*Hoosier Hort.*, xxiii, 3, pp. 40–41, 1941.

From 1934 to 1940 the development of the ascospores of apple scab [*Venturia inaequalis*] was followed at 18 locations in Indiana, and each

spring maturity was found to have been reached by the time the buds were in the delayed-dormant stage [*R.A.M.*, xx, p. 104], sometimes two to three weeks earlier. The ascospores did not all ripen simultaneously, the entire process of maturation and expulsion occupying a period of two to three months. In most years a very high percentage of the fructifications was discharged before the application of the first cover spray. Growers are advised to give a treatment of 2 in 100 lime-sulphur at the pre-pink stage, followed by sulphur sprays at six- to seven-day intervals until the first cover.

Anderson (H. W.). **Apple tree anthracnose in Illinois.**—*Plant Dis. Reptr*, xxiv, 23, p. 475, 1940. [Mimeographed.]

Apples from Jo Daviess county, Illinois, left in a container for some days, showed the presence of *Neofabraea malicorticis* [*R.A.M.*, xix, p. 226]. The fact that the disease has also been reported from Maine indicates that it may be more widely distributed in the northern apple-growing region of the United States than has been supposed. The trees in the Illinois orchard had all been obtained from a Missouri nursery, and not from the north-west.

Eide (C. J.) & Christensen (C. M.). **Wood decay in Apple trees in Minnesota.**—*Phytopathology*, xxx, 11, pp. 936–944, 2 figs., 1940.

Ten species of wood-rotting fungi were isolated on malt or potato dextrose agar from the decayed regions of felled apple trees in Minnesota between 1936 and 1938, 48 out of 50 15-year-old trees being partially rotted 3 ft. above soil-level, 12 out of the 68 22-year-old trees showing extensive involvement of the trunk, while moderate to slight infection was found in 44 out of the remaining 56 up to 30 years of age. The fungi were *Fomes applanatus* [*Ganoderma applanatum*], *Trametes malicola*, *Polyporus* [*Polystictus*] *versicolor*, *Thelephora* sp., *Polyporus resinosus*, *Pholiota adiposa*, *Schizophyllum commune* [*R.A.M.*, xvii, p. 688], *Trametes hispida*, *Polyporus adustus*, and *Lenzites betulina*. The number of wood-rotting fungi isolated but not identified equalled or exceeded those enumerated. Branch stubs were the chief means of entry, others being crotch cracks, sun scald and frost injuries. No one species or combination of species was observed with sufficient frequency to be deemed responsible for the major part of the decay, which is thought to be one of the factors in the early decline of apple trees in the State, and might be obviated to some extent by the prevention or proper care of wounds. The sporophores of *S. commune* occurred in profusion on bark killed by sun scald, the fungus being probably a secondary invader. Most of the rots were white, but those associated with *Pholiota adiposa* and *T. malicola* were of the brown, cubical type.

Klee (H.). **Schädigungen durch Taphrina deformans (Berk.) Tul. an Pfirsichfrüchten.** [Injuries to Peach fruits by *Taphrina deformans* (Berk.) Tul.]—*NachrBl. dtsch. PflSchDienst.* xx, pp. 13–14, 1940. [Abs. in *Zbl. Bakt.*, Abt. 2, ciii, 6–8, p. 125, 1941.]

Peach fruits (especially of the Proskau variety) as well as leaves [? in Germany] were observed to show the slight superficial puffiness and wrinkling due to *Taphrina deformans*, early attacks by which

sometimes also caused shrivelling, malformation, and shedding. Asci were not detected, but the identity of the pathogen is not considered to be in doubt.

DUNEGAN (J. C.). **Physalospora obtusa on Peach nursery stock in Arkansas.**—*Plant Dis. Reptr*, xxv, 1, pp. 25–26, 1941. [Mimeographed.]

Physalospora obtusa was isolated on maize meal agar from the dark brown or black, sunken tissues of basal cankers on the main stems of young peach trees in a commercial nursery in Arkansas. The affected trees (only 1 per 1,000) occurred as isolated cases scattered through the nursery. The cortical tissues of the invaded areas were brown and collapsed, and contained longitudinal gum pockets. In the older portions of the cankers the xylem, as well as the outer zones, was involved in the discoloration, only the pith cylinder retaining its normal aspect. The pathogen is believed to have entered the stems through mechanical injuries.

ROBERTS (J. W.). **The constriction disease of Peach.**—*Phytopathology*, xxx, 11, pp. 963–968, 1 fig., 1940.

The constriction disease of peach described by Selby (*Bull. Ohio agric. exp. Sta.* 92, pp. 233–234, 1898) was observed in Delaware in 1938 causing severe damage to weakened or injured trees. The infected areas are pale tan to brown and are usually centred round a dead bud. The girdling results in the wilting and death of the branch above. The agent of the trouble, originally referred to *Phoma persicae* [*R.A.M.*, xvii, 472], is believed on the basis of further investigations to be identical with *Phomopsis mali*. The α conidia isolated from two affected peach trees in Delaware measured 8 to 9 by 3 to 4 and 6 to 8 by 3 μ, respectively, and the β forms 28 to 36 by 1 to 2 and 26 to 33 by 1 to 2 μ. These dimensions agreed fairly closely with those of isolates from peach in New Jersey (no β conidia), and cherry, apple, and pear in Maryland. All the isolates, except one from Delaware peaches, were inoculated into wounded peach and apple branches with positive results. The disease would appear to correspond with the die-back attributed in Great Britain to *Diaporthe perniciosa* [ibid., xvii, p. 466] or *D. eres* according to Wehmeyer's classification [ibid., xiii, p. 270], with which the Delaware pathogen is presumably identical, although the perfect stage has not yet been observed either in nature or in culture.

HILDEBRAND (E. M.) & PALMITER (D. H.). **Status of yellow-red virosis in 1940.**—*Plant Dis. Reptr*, xxiv, 23, pp. 470–473, 1 map, 1940. [Mimeographed.]

Since the authors' last note on the distribution of the 'X' disease or yellow-red virosis of peaches in New York State [*R.A.M.*, xviii, p. 401; xix, pp. 292, 548] the disease has spread to peach orchards in another Hudson Valley county and three counties of western New York. So far, it has been found on peach in 7, and on chokecherry [*Prunus virginiana*] in 43, counties. The disease is gradually moving southwards and northwards, and is now much more abundant than before in areas already invaded. Peach orchards first found affected in 1939 showed 20 to 100

per cent. increase in infected trees in 1940. Trees presenting the disease for the second year bore practically no fruit. Orchards affected for three years and in which no attempt has been made to check the disease are virtually 100 per cent. affected and are being removed.

Diseased chokecherries have been found in or near many orchards at present unaffected, and it is considered to be only a matter of time for these orchards to become attacked unless diseased chokecherries in the vicinity are removed to a distance of at least 500 ft. Thorough spraying of chokecherries in July with sodium chlorate (¾ lb. per gal. water) gave a high degree of kill. Similar applications in September were much less satisfactory.

Richards (B. L.). **Virus disease of Peaches spreading in Utah.**—*Plant Dis. Reptr*, xxiv, 23, p. 474, 1940. [Mimeographed.]

'X' disease of peach [see preceding abstract] was first observed in Utah on chokecherry [*Prunus virginiana*] in 1937 and on peach in Box Elder County in July, 1939. Preliminary surveys in August, 1939, showed the disease to be generally distributed in high percentages throughout Box Elder, Weber, and Davis Counties. In 1940, it was found in Salt Lake and Cache Counties. Utah County and the southern peach areas of the State appear, as yet, to be unaffected. Of 20 orchards visited in Davis County in 1939, only two over four years old were unaffected. The average incidence of infection for the 20 orchards was 23 per cent. of the trees. In five of the orchards over 40 per cent. of the trees were diseased, and in one of these (six years old) the figure was 68 per cent., and the disease was so severe that all the trees were pulled out and destroyed. In 1940, incidence reached 75 per cent. in some orchards. Definite evidence was obtained that the disease is transmissible.

Blodgett (E. C.). **Rusty spot of Peach.**—*Plant Dis. Reptr*, xxv, 1, pp. 27–28, 1941. [Mimeographed.]

Attention is drawn to the detection in Idaho during the summer of 1940 of an apparently undescribed peach disease, herein provisionally designated 'rusty spot' and characterized by the presence on the young fruits of small, rust-coloured spots, looking as if drops of rusty water had settled into the superficial hairs, which are rubbed off, leaving a bald and finally purplish, smooth, shiny patch. With the approaching maturity of the fruits, the diseased areas, which may cover half or the whole surface, often developed a well-marked red, pink, or bluish-purple margin. Severe dwarfing and malformation of the fruits was a feature of the disorder in extreme cases, the flesh further being hardened and insipid. The leaves and twigs of the trees were normal. Usually when any fruit on a tree was affected the whole tree was diseased, while adjacent trees may show no symptoms. Further investigations are in progress.

Staehelin (M.). **Une dangereuse maladie des sarments du Framboisier** [A dangerous disease of Raspberry spurs.]—Reprinted from *Rev. hort. vitic. Suisse rom., 1940*, 5, 3 pp., 2 figs., 1940.

A semi-popular description is given of the life-history and symptoms

of raspberry spur blight (*Didymella applanata*), the rapid extension of which in Swiss plantings [*R.A.M.*, xvii, p. 375] gives serious cause for alarm. The following schedule of preventive treatments is recommended on the basis of experiments at the Lausanne Viticultural and Arboricultural Station from 1935 to 1938 on the Preussen, Winkler Seedling, and Lloyd George varieties (the last-named used in 1938 only): cutting off and burning of dry or wilting shoots in the spring; two to three applications of Bordeaux mixture (1 per cent. used in the experiments) or copper oxychloride (cuprenox) [ibid., xvi, p. 773] with the addition of an adhesive from mid-May to the onset of flowering; after the harvest, during August and September, treatment with copper dusts (sulfostite); and between November and February 2 per cent. Bordeaux mixture.

ZUNDEL (G. L.). **A new Black Rasberry disease in western Pennsylvania.** —*Plant Dis. Reptr*, xxv, 3, pp. 87–91, 1941. [Mimeographed.]

Black raspberries [*Rubus occidentalis*] in western Pennsylvania have recently become affected by a very serious trouble for which the name 'brown berry disease' is proposed pending further knowledge of its etiology, now under investigation. The berries turn brown and harden to such a degree that they adhere firmly to the receptacle, causing difficulty in the separation of the drupelets. Every berry in a given cluster may be attacked, the Cumberland variety sustaining heavier damage than Plum Farmer. The tabulated results of counts of 100 fruit clusters (864 berries) in Lawrence County revealed an incidence of 81·2 per cent. infection, the corresponding figure for a similar count in Butler County on 984 berries being 61·8. These conservative estimates represent heavy losses to the growers concerned, and a remedy is urgently necessary to save the industry from extinction. A disorder of the same type as the foregoing is also reported from Ohio.

PLAKIDAS (A. G.). **Purple leaf spot of Strawberry.**—*Phytopathology*, xxxi, 3, pp. 225–240, 4 figs., 1941.

English and Latin diagnoses are given of *Mycosphaerella louisianae* n.sp., the agent of a hitherto undescribed strawberry disease in Louisiana, North Carolina, and Mississippi, the symptoms of which agree well with those reported by Wolf for leaf scorch (*Diplocarpon earliana*) [*R.A.M.*, v, p. 616] except for the absence in the former of 'dark, glistening acervuli' on the surface of the spots. The reddish-purple, later brownish, spots, 1 to 5 mm. in diameter, tend to coalesce and form large irregular, purple areas on the leaves.

The fungus is characterized by groups of erumpent, amphigenous, black, globose, ostiolate perithecia, 34 to 75 by 34 to 75 (average 56·9 by 59·8) μ, and cylindrical to clavate asci, borne on short stalks, fasciculate, the marginal ones curved, the central straight, aparaphysate, 27·3 to 39 by 5·9 to 7·3 (32·7 by 6·4) μ, each containing eight imperfectly biseriate, hyaline, bicellular, obtuse ascospores, 6·8 to 10·2 by 2·4 to 3·4 (8·9 by 3·1) μ. No conidial stage was observed either in nature or in culture, but since the perithecia develop at all times of the year soon after the death of infected leaves, no other types of fructification are necessary to ensure the perpetuation of the fungus, which throve on a number of standard media at 25° C. The pathogenicity of

the organism was demonstrated by inoculation experiments on 72 Klondike plants, ingress being effected through stromata on the lower leaf surface only.

M. louisianae differs from *M. fragariae* in its smaller perithecia, asci, and ascospores and in its predominantly hypophyllous instead of epiphyllous position of the perithecia. The purplish lesions produced by *M. louisianae* never develop the greyish-white centres characteristic of those due to *M. fragariae*. It also differed in not producing conidia in culture. Conclusive proof of the genetic connexion between *M. fragariae* and *Ramularia tulasnei* has hitherto been lacking, but was obtained by sowing on agar disks single and multiple ascospores, derived from perithecia on overwintered wild strawberry (*Fragaria virginiana*) leaves in Michigan, which gave rise to an abundance of conidia morphologically indistinguishable from Louisiana specimens of *R. tulasnei*. However, judging by the scarcity of mature perithecia and the profusion of sclerotia on overwintered foliage from widely separated areas, the ascigerous stage of *R. tulasnei* is of little importance in the perpetuation of the fungus, even in northern latitudes.

Das Gupta (S. N.), Verma (G. S.), & Sinha (S.). **Studies in the diseases of Mangifera indica Linn. Part III. Investigation into the effect of sulphur dioxide gas on the Mango fruit.**—*Proc. Ind. Acad. Sci.*, Sect. B, xiii, 1, pp. 71–83, 2 pl., 1941.

Experiments in which mangoes still attached to the trees were exposed inside specially designed chambers to known concentrations of sulphur dioxide gas [*R.A.M.*, xix, p. 663] for periods ranging from 30 minutes to eight days showed that such exposure produced brick-red spots on the skin. The spots enlarged after the fumigation, and in some cases coalesced, but this condition in no way resembled black tip disease [loc. cit.]. In the affected region the epidermal cells lost chlorophyll, starch was reduced, the cell walls turned brown, and light brown deposits occurred in the cell cavities, the effect on the tissue being greatest just below the lenticel. Suberization occurred round the affected area. The deposits found in the epidermal and mesocarp cells were comparable with those seen in the first etiolation stages of black tip disease, but no conclusions can yet be drawn from this observation.

Yamamoto (W.). **A brownish sooty mould, Phaeosaccardulina javanica (Zimm.) comb. nov., on Persimmon.**—*Ann. phytopath. Soc. Japan*, x, pp. 254–264, 1940. [Japanese, with English summary.]

A description is given of a very prevalent brownish sooty mould occurring in association with the scale insect *Tachardina theae* on persimmon leaves in Formosa, and with other insects on a wide range of hosts, namely, *Phaeosaccardulina javanica* (Zimm.) n. comb., six of the 15 synonyms of which are listed as *Capnodium javanicum* Zimm., *P. theae*, *P. samoensis*, *Chaetothyrium javanicum*, *Limacinia javanica*, and *Limacinula javanica* [*R.A.M.*, x, p. 558].

Grubitsch (H.). **Copper-bearing sprays.**—*Öst. ChemZtg*, xliii, pp. 214–220, 1940. [German. Abs. in *Chem. Abstr.*, xxxv, 7, p. 2267, 1941.]

Studies were conducted on the effect of the copper sulphate pentahy-

drate: sodium carbonate ratio in copper-soda sprays, of the copper sulphate pentahydrate: calcium hydroxide ratio in those of copper-lime, and of the temperature of preparation and other factors on the proportion of dissolved and ionized copper and on the hydrogen-ion concentration of the mixture. Determinations were made of the copper: carbon dioxide ratio in sediments from copper-soda sprays and of the effect of mixing ratios in both types of sprays on the velocity of sedimentation. It is concluded that the toxic action of copper-containing mixtures on plant tissues [*R.A.M.*, xv, p. 36 *et passim*] is due to the presence of ionic copper. In the phenolphthalein-reddening copper-lime sprays employed in practice the amount of copper in the solution ranges from 10 to 150 mg. per l. and the ionized copper from 10^{-3} to 10^{-10} mg. per l. In copper-soda sprays the heaviest burning of vines occurs when the ratio of copper sulphate pentahydrate to sodium carbonate ranges from 1 : 1·00 to 1 : 1·200. The dissolved copper varies between 85 and 100 mg. per l., and the ionized copper from 30 to 40. Carbon dioxide escapes from copper-soda mixtures in the process of spraying, resulting in a sharp decrease in dissolved and ionized copper. Assuming that a non-toxic copper concentration is first attained during the course of spraying, poor atomization would entail scorching of vine foliage. The toxicity of copper-lime sprays increases parallel with the neutralization of the spray sediment by atmospheric and respiratory carbon dioxide, but copper-soda mixtures lose part of their toxicity in spraying and more on the drying-out of the deposit and washing-out of soluble salts by rain and dew. The effect of weather conditions at the time of spraying is discussed, and a bibliography of 22 references appended.

Naoumoff (N. A). Болезни сельскохозяйственных растений (фитопатология). [Diseases of economic crops (phytopathology)].—566 pp., 134 figs., Госуд. Издат. колх.-совх. Литер. „Сельхозгиз". [State Publ. Off. Lit. collect. co-op. Farming 'Selkhozgiz'], Leningrad, 1940. Roub. 12. Kop. 35.

This is a general text-book on non-parasitic, bacterial, fungous, and virus diseases of economic plants, divided into six chapters dealing fairly fully with general information on plant diseases, methods of controlling plant diseases, diseases of field crops, diseases of vegetable and similar crops, and diseases of fruit and berry crops, respectively. Certain important diseases other than those occurring in U.S.S.R. are discussed in the text, which aims at providing a general introduction to the subject of plant pathology for students in agricultural colleges. A bibliography of 26 pages of mainly Russian literature is appended.

Puttemans (A.). **Some data concerning the history of phytopathology in Brazil and the first notices of diseases of plants in the country.**—*J. Agric. P. R.*, xxiv, 3, pp. 77–107, 9 pl., 1940.

This is an English translation by Anna E. Jenkins and Annie D'Armond Marchant of an address on the history of phytopathological research in Brazil delivered by the author (since deceased) in Portuguese at the General Session, 22–23 January, 1936, of the First Meeting of the Phytopathologists of Brazil. The original text was published in *Rodri-*

guesia 2 (numero especial), pp. 17–36, 1936 (1937). [The translation is preceded by a foreword by Miss Jenkins, and a digest of Puttemans's paper by the same author appears in *Chron. bot.*, vi, 10, pp. 224–226, 1941.]

DADE (H. A.). **A revised list of Gold Coast fungi and plant diseases.**—*Kew Bull., 1940*, 6, pp. 205–247, 1940.

This list is in part a revision of that published in 1924 [*R.A.M.*, iv, p. 495], and includes numerous new records made since then. A preface briefly indicates the history of plant pathological research in the Gold Coast and the nature of the records. Part I is a list of fungi and viruses arranged alphabetically in broad systematic groups; part II is a host index.

STEVENS (N. E.). **Recent trends in plant disease control.**—*Trans. Ill. Acad. Sci.*, xxxiii, 2, pp. 66–67, 1 graph, 1940.

With a view to discovering whether there were any significant changes in emphasis on the type of disease control studied and recommended by plant pathologists throughout the world of recent years, the writer analysed the references to this subject appearing in the *Review of Applied Mycology* during the period from 1922 to 1938, inclusive. Following a slight increase in the already large number of such references (some 556 per annum) at the opening of the period, there was a sharp drop beginning about 1926 and culminating in 1931, succeeded by a second increase and a smaller drop in 1935–6. Allowing for the possible errors involved in the nature of the method of computation [cf. *R.A.M.*, xx, p. 269], it appears probable that the first large decline reflects a natural loss of interest in plant disease control associated with a marked surplus of agricultural products in most of the countries actively engaged in phytopathological research, while the upward trend soon after 1930 coincides with a degree of financial recovery and some regulation of the volume of agricultural production.

Throughout the period under review, spraying and dusting make up approximately one-third of the total number of proposed control measures. Next in importance comes seed treatment, which shows some decline in popularity from its peak of nearly 20 per cent. in 1926 to 13 per cent. in 1933, followed by an increase due in all probability to the development of new and very effective chemical compounds. Breeding for resistance has been rather more widely advocated during the last ten years than at the opening of the period under discussion, but still accounts for only 10 per cent. of all suggestions for control. Interest in local sanitation, including eradication, has diminished from between 12 and 13 to 6 to 7 per cent., while a similar falling-off is noticeable in the cases of seed certification and heat treatments. On the other hand, from 1928–9 onwards there has been a steady increase in the number of recommendations for the control of soil deficiency diseases by the application of minute amounts of essential chemical elements, especially boron, reaching 10 per cent. of the whole in 1935.

COTTAM (C.). **The Eelgrass situation, fall 1940.**—*Plant Dis. Reptr*, xxv, 2, pp. 46–52, 1941. [Mimeographed.]

Although the situation as regards the condition and abundance of

eelgrass (*Zostera marina*) in the areas of Canada and the United States affected by wasting disease (*Labyrinthula*) [? *macrocystis*: *R.A.M.*, xix, p. 421] was not altogether uniform in the autumn of 1940, taking the Atlantic coast as a whole, the improvement is more marked than at any time since the onset of the trouble in 1931, especially in regions of reduced salinity.

FELDMANN (J.). **Une nouvelle éspèce de Plasmodiophora (P. bicaudata) parasite du Zostera nana Roth.** [A new species of *Plasmodiophora* (*P. bicaudata*) parasitic on *Zostera nana* Roth.]—*Bull. Soc. Hist. nat. Afr. N.*, xxxi, 7–9, pp. 171–177, 2 figs., 1940.

A technical description [accompanied by a Latin diagnosis] is given of *Plasmodiophora bicaudata* n.sp., isolated from specimens of *Zostera nana* (a species unaffected by the dying-off disease attributed to *Labyrinthula* [? *macrocystis*: see preceding abstract] or other agencies) in Mauretania (French West Africa) in 1938, and regarded as the agent of a thickening of the stems, curtailment of the internodes, and cellular hypertrophy of the host. The organism is characterized by plurinucleate plasmodia, the nuclei numbering 20 to 50 and measuring 3 to 4 μ in length, single, yellow (fuscous in the mass), ovoid spores, 7 by 3 to 3·5 μ, tapering to a point at either end and each one entirely filling a host cell. The myxamoeboid stage was not observed.

Techniques for appraising air-borne populations of micro-organisms, pollen, and insects.—*Phytopathology*, xxxi, 3, pp. 201–225, 5 diags., 1941.

The Committee on Apparatus in Aerobiology, National Research Council, Washington, D.C., here presents a survey of the literature on the mechanism of appraisal of air-borne populations of micro-organisms, pollen, and insects, the various aspects of the subject being discussed under the following headings: germ theory of disease and origin of life; sanitary air analysis; air-borne pollen dissemination; micro-organisms in the upper air; epidemiology of plant diseases; and insect population and migration in the air. A number of the papers included in the bibliography of 97 titles have been noticed in this *Review*.

KLECZKOWSKI (A.). **Quantitative studies on the serological reactions of some plant viruses and of a Pea nodule bacterium (Rhizobium leguminosarum).**—*Brit. J. exp. Path.*, xxii, 1, pp. 44–58, 3 graphs, 1941.

A tabulated account is given of the writer's studies at the Rothamsted Experimental Station on the serological reactions to definite weights of the tobacco mosaic and tomato aucuba mosaic and bushy stunt viruses in the liquid crystalline state, prepared by precipitation methods as described by Bawden and Pirie [*R.A.M.*, xix, p. 232], as well as of a strain of the pea nodule bacterium, *Rhizobium leguminosarum*, and of cross-reactions between the tobacco and aucuba mosaic viruses.

An aucuba mosaic virus antiserum contained antibodies reacting with the homologous virus but not with that of tobacco mosaic, in addition to those reacting with both viruses, whereas all the antibodies in a tobacco mosaic virus antiserum reacted with both viruses.

Fewer differences than might have been expected were found between the serological behaviour of the rod-shaped tobacco and aucuba mosaic viruses on the one hand, and the spherical bushy stunt on the other, none, in fact, in the region of antibody excess. In antigen excess, however, some four times the weight of precipitate can be obtained with the tobacco mosaic as with the bushy stunt virus. Maximal precipitate with the former was likewise obtained in much greater excess, about 30 times the amount of virus needed for equivalence compared with 1·5 times for the latter.

KREUTZER (W. A.), BODINE (E. W.), & DURRELL (L. W.). **A sexual phenomenon exhibited by certain isolates of Phytophthora capsici.**—*Phytopathology*, xxx, 11, pp. 951–957, 2 figs., 1940.

This is an expanded account of the writers' studies on the factors governing sexual reproduction in *Phytophthora capsici* in Colorado, a note on which has already appeared [*R.A.M.*, xx, p. 44]. Oospore formation resulted only from the pairing of cultures from a wilted chilli stem and a decaying cucumber fruit, no such phenomenon being observed when two chilli or two cucumber isolates were paired. Three out of four cultures (two from cucumber and one from chilli) produced oospores after 6 to 8 months of separate growth, the chilli isolate utilizing only potato dextrose agar for this purpose and those from cucumber bean pods. The average diameter of the oospores of the two cucumber isolates and one from chilli were 27·9, 2[illegible]·9, and 30·5 μ, respectively. The optimum temperature for sporangial development in all the isolates under investigation was close to 30° C.

LING (L.) & YU (E. H.). **Thermal death point of fungi in relation to growing conditions.**—*Phytopathology*, xxxi, 3, pp. 264–270, 1 graph, 1941.

In laboratory experiments at the Szechuen Provincial Agricultural Improvement Institute, Chengtu, China, the thermal death points of beef peptone broth spore suspensions at P_H 6 of *Colletotrichum nicotianae*, *C.* [*Glomerella*] *gossypii*, and *C. glycines* were determined as 44° to 50°, 48° to 52°, and 48° to 51° C., respectively. In tests in which the reaction of the medium was modified, it was found that conditions favourable to fungus growth generally induced resistance to heat in the conidia. Nutritional factors appeared to be of little importance in relation to thermal resistance in the species under observation, except that *C. nicotianae* succumbed to 46° on potato dextrose agar compared with 49° for complete Richards's medium and the same minus potash and 50° for Richards's medium minus phosphorus.

RAMAKRISHNAN (T. S.). **Studies in the genus Colletotrichum. 1. Saltation in Colletotrichum capsici (Syd.).**—*Proc. Ind. Acad. Sci.*, Sect. B, xiii, 1, pp. 60–70, 1 pl., 1941.

A study of saltation in *Colletotrichum capsici* from wilting safflower (*Carthamus tinctorius*) in India, based on the parent strain C, and four saltants, C_1, C_2, C_3, and C_4, showed that C, C_1, and C_4 gave numerous appressoria. In C_3 these were less frequent, and in C_2 they were generally lacking. In the saltants the acervuli were smaller than in the

parents, varied in colour, and were sometimes clustered together. Black stromatoid bodies were formed abundantly, particularly in C and C_3; in C_1 and C_4 they were less numerous, and lighter-coloured. In general, they resembled the stromatic base of the acervuli, but were without conidiophores and conidia, though sometimes bearing setae. The greatest variation appeared in the setae, which in C and C_3 were either elongated, blackish-violet, thick at the base and tapering towards the apex, or less deeply coloured, and with a much lighter, rounded apex. Some of the setae of C showed the formation from the terminal portion of a cluster of hyaline or slightly coloured branches resembling the conidiophores, and from the tips of which spores developed. In C_1 and C_4 the setae were fewer, smaller, and lighter, and only one or two (or none) were present in each acervulus. Variation was also observed in the colour of the spore masses, in sporulation (none in C_2), and spore size.

The different forms betrayed marked differences in pathogenicity. For instance on *Cicer arietinum* C and C_3 produced a black rot of the tissues, which killed the plants, while with C_2 only one plant became affected and the infection failed to spread. On both hosts C_2 failed to produce acervuli whereas C and C_3 developed them conspicuously, C_1 less prominently. C showed a close similarity to *C. capsici* from diseased *Capsicum annuum* fruits in morphological, cultural, and pathogenic characters, and is therefore referred to this species.

Schultz (E. S.), Clark (C. F.), & Stevenson (F. J.). **Resistance of Potato to viruses A and X, components of mild mosaic.**—*Phytopathology*, xxx, 11, pp. 944–951, 1940.

It has been experimentally shown that on the basis of symptomatology the reactions of potato seedling varieties to virus X [*R.A.M.*, xviii, p. 544; xx, p. 273] may be classified as (*a*) symptomless carriers, (*b*) necrotic, (*c*) light green and slightly rugose, and (*d*) faintly mottled. On the basis of resistance to virus X, the varieties may be grouped as (*a*) immune, (*b*) rarely infected, and (*c*) easily infected. The corresponding reactions to virus A may be expressed on a symptomatology basis as (*a*) necrotic, (*b*) pale green and rugose, and (*c*) mottled, while on the basis of resistance to virus A the categories are the same as already defined in respect of X. The resistance reaction of the parents to virus A or X is transmitted to a high percentage of the progeny of crosses, especially in the case of two resistant progenitors. Earlaine, Katahdin, and S 24642 are immune from virus A by aphid infection but susceptible to it by grafting. These varieties apparently segregate for resistance and susceptibility to virus A in crosses with non-resistant varieties. Progenies of virus X-immune × virus A-immune have been developed combining immunity from both viruses and should play an important part in the control of mild mosaic, of which these viruses are components.

Sanford (G. B.) & Clay (S. B.). **Purple dwarf, an undescribed Potato disease in Alberta.**—*Canad. J. Res.*, Sect. C, xix, 3, pp. 68–74, 4 pl., 1941.

During the last ten years a potato disease, apparently hitherto undescribed, and for which the name 'purple dwarf' is suggested, has

developed in many fields in southern, central, and north-central Alberta. It seems to affect all districts equally, but has not so far seriously reduced yield; the number of affected plants seldom exceeds 1 per cent., and while in a few cases infection has reached 5 per cent., many fields appear to remain unaffected. All varieties seem to be susceptible.

Affected plants are readily recognizable as they emerge from the affected seed pieces, being stunted, rigid, brittle, and frequently dark green. The sprouts may remain abortive and die. General stunting and distortion, with the early development of a purple colour, especially on the margins of the apical leaves, are invariably present under field conditions. The underground parts are at first apparently normal, but before long the older roots, then the stolons, and finally the epidermis of the lower stem turn brown and decay, discoloration starting at the extreme base of the stem and spreading outwards through the roots and stolons and upwards through the stem. The outer part of the brown roots and stolons may easily be slipped off. Tubers from affected plants are seldom over one inch in diameter, and as a rule only a very few small ones, or none, develop. These tubers always show severe necrosis. The stolons and tubers give no secondary growth, and the parent set usually remains sound.

Under field conditions, the pith of the stem remains normal to dark green in colour, and sound until the disease is well advanced, when general disorganization may begin at the base of the stem, following bacterial and fungal infection. In the tuber and upper stem the pith usually remains normal. The phloem throughout the stems, stolons, and roots is discoloured and often plugged with a material staining deeply with sudan III. A marked browning of the exterior of the vascular cylinder is a characteristic symptom in the lower stem, stolons, and roots.

Experimental evidence and field observations strongly indicated that transmission occurs through affected tubers. All the affected plants examined in commercial fields had originated from affected tubers. Also, the condition was transferred to the stem of healthy potato plants by inserting a piece of petiole from affected potato plants. Furthermore the tissue of purple dwarf plants yielded neither bacteria nor fungi. On these grounds, therefore, the disease is considered to be of virus origin.

Incidence of Potato late blight in 1940.—*Plant Dis. Reptr*, xxiv, 22, pp. 452–460, 1940. [Mimeographed. Received May, 1941.]

In these notes on the potato late blight (*Phytophthora infestans*) situation in different parts of the United States in 1940, O. D. Burke states that in Pennsylvania an interesting development in regard to control is the organization of 'spray rings'. Farmers have banded themselves together in groups of 30 to 60, representing 150 to 250 acres of potatoes. They have agreed to have their acreage sprayed at a definite charge ($1·50 to 1·75) per acre per application, throughout the growing season, materials and water being provided by the operator. The area affected by this type of organization grew from 640 acres in 1939 to well over 3,000 acres in 1940. Spray machines on rubber-tyred tractors are used. Both 8- and 10-row booms with 3 nozzles per row and pumps delivering 20 to 30 gals. per minute proved satisfactory. All

operators of the spray machines in these rings follow the official control recommendations.

R. A. Jehle noted that in yield test plots in Maryland much late blight tuber rot occurred in an unsprayed plot, though virtually no infection was noted on the vines. In one field in Anne Arundel county little infection was found in the tops of the Sequoia variety, but late blight tuber rot was very prevalent in a part of the field were there was clay soil. U.S.D.A. seedling 46464 (a cross between McCormick and Katahdin), planted next to Sequoia in the heavy clay part of the field, showed only one affected tuber.

R. E. Vaughan and J. W. Brann draw attention to the fact that in the Langlade and Oneida County areas of Wisconsin 12 applications of Bordeaux mixture were required to keep the foliage properly protected.

Naoumoff (N. A.), Vesselovsky (I. A.), & Kameraz (A. Y.). Рак Картофеля [Potato wart].—112 pp., 17 figs., Госуд. Издат. колх.-совх. Литер. „Сельхозгиз". [State Publ. Off. Lit. collect. co-op. Farming 'Selkhozgiz'], Leningrad, 1940. Roub. 1. Kop. 35.

In this popular booklet on the wart disease of potatoes (*Synchytrium endobioticum*), it is stated that the disease has not so far been found in the U.S.S.R., but it is known to occur in the newly acquired territories formerly belonging to Finland (in Carelia) and Poland (White Russia and the Ukraine).

Person (L. H.) & Martin (W. J.). **Soil rot of Sweet Potatoes in Louisiana.**—*Phytopathology*, xxx, 11, pp. 913–926, 6 figs., 1940.

A description is given [without a Latin diagnosis] of *Actinomyces ipomoea* n.sp., the causal organism of soil rot, a very serious disease of sweet potatoes in Louisiana [*R.A.M.*, viii, p. 598], especially under dry conditions and in soils with a P_H value above 5·2, first observed in the State in 1934 and characterized by dwarfing of the plants, decay of the root system, small, dark, elongated lesions on the stems below soil-level, and pits, ¼ to over 1 in. in diameter with uneven margins, on the mature tubers. The fungus is considered by Waksman to be distinct from *A. poolensis* and is distinguished on dextrose-casein agar by oval to elliptical conidia, 1·3 to 1·8 by 0·9 to 1·3 μ, occurring in partly spiral-shaped chains; the mycelium on dextrose, egg albumen, and starch agars is white to bluish-green, the colour of the colonies on different media ranging from cream, through new silver, dawn grey, olive-yellow, and light brown to argus brown (Ridgway); gelatine is liquefied and milk hydrolysed; nitrites are formed in fair abundance on glycerine synthetic solution and nitrate broth. The optimum temperature for growth is about 32° C.

A simple and practical method of testing the virulence of isolates of *A. ipomoea* in the laboratory is described. Soil inoculation experiments with pure cultures of the fungus on Puerto Rican sweet potatoes gave positive results in the greenhouse and field.

Van der Veen (R.). **Zonnebrand bij Hevea.** [Sun scorch of *Hevea*.]—*Bergcultures*, xv, 11, p. 314–317, 1 diag., 1941.

During the very dry season of 1940, the writer investigated an exceptionally large number of cases of associated sun scorch and infection

by *Botryodiplodia theobromae* among *Hevea* rubber seedlings and one-year-old or older bud grafts in the Besoeki district of Java [*R.A.M.*, xiii, p. 160], where the BD. 5 selection proved to be the most susceptible, Tjir. 1, AV. 255, LCB. 1320, and PR. 107 also suffering to a lesser extent, except in very sandy soils, while PR. 7 was exempt from the trouble. The disturbance most commonly assumed the form described by Sharples (Diseases and pests of the rubber tree, p. 352) [ibid., xvi, p. 60] as 'spear-head wounds', ranging in length from a few cm. to over 1 m., and occurred in all degrees of severity, from small, discoloured patches on the outermost bark of the side of the tree facing west and exposed to the sun's rays at the midday during the critical period for the development of the injury, to necrotic areas involving three-quarters of the cortex and a large portion of the wood at the base of the graft. Sun scorch and its attendant fungal infection are ordinarily confined to the dry period of the east monsoon on soils of slight moisture-holding capacity, and may be entirely prevented by whitewashing the stems and thereby reducing the surface temperature from 60° C. on a dark ground to 42°.

Onderzoekingen over vlekkenkanker en lumpkanker bij Hevea in Indo-China. [Investigations on patch and lump canker of *Hevea* in Indo-China.]—*Bergcultures*, xv, 6, pp. 160–161, 1941.

This is a résumé (signed 'Fr') of two papers by L. Roger, published by the Indo-China Institute of Agricultural Research, dealing with patch and lump canker of *Hevea* rubber in that country. The term 'patch canker' is not strictly applicable to the form of the disease occurring in Indo-China, where *Pythium complectens* [*R.A.M.*, xviii, pp. 265, 472] is the agent of infection, but the control measures recommended (precautions in connexion with tapping operations, excision of the invaded area, and disinfection with formalin of the resultant wound, which should then be covered with green petrolatum vaseline or a vaseline and coal tar mixture), are similar to those practised against *Phytophthora palmivora* in the Dutch East Indies [ibid., xvi, p. 634 *et passim*]. The first symptom of attack by *Pythium complectens* is a greyish-yellow, brown-edged discoloration of the bark, later turning wine-coloured, mauve, purple, or variegated, and ultimately becoming uniformly brown and somewhat moist. The coagulation of the latex below the loosened bark in malodorous, oval lumps, yielding to pressure and measuring up to 20 by 15 cm., gradually results in the rupture of the cortex. Infection is stated to originate in the inner bark and proceed outwards; the slimy, red exudate characteristic of the disease in Malaya is rarely observed in Indo-China. The most severe infections are those situated on the root-collar, whence spread to the lateral roots is frequent and girdling of the tree rapidly ensues.

Kanivetz (I. I.), Chariton (J. G.), & Tultshinskaya (Mme E. M.). **Ertragssteigerung bei Zuckerrüben, Hafer und Lupine bei verschieden starker Impfung des Bodens mit dem Pilz Trichoderma lignorum.** [Yield increase in Sugar Beets, Oats, and Lupins through the inoculation of the soil with varying amounts of the fungus *Trichoderma lignorum*.]—*Microbiology*, ix, pp. 143–151, 1940. [Russian. Abs. in *Chem. Zbl.*, cxi (ii), p. 2075, 1940.]

In experiments in boxes filled with medium podsol soil and kept in the

open at the Pan-Russian Institute for Sugar Industry, Kieff, the following yields were obtained following inoculation with a triple dose of *Trichoderma lignorum* [*T. viride*]: sugar beets 115 per cent. over the controls, oats 128 per cent.; with the same plus *Aspergillus niger* the figure for sugar beets was 109 per cent. [*R.A.M.*, xx, p. 381]. The structural consolidation of the soil was greatly furthered by the admixture of the fungus: thus, the accession of aggregates of >0·25 mm. amounted to 68 and 27 per cent. in beets and oats, respectively, with a triple dose. A suitable standard rate for the incorporation of *T. viride* into the experimental soils was found to range from 20 to 60 kg. per ha.; uniform distribution is important.

Waksman (S. A.) & Woodruff (H. B.). **Actinomyces antibioticus nov. sp., a new antagonist against micro-organisms.**—Abs. in *J. Bact.*, xli, 1, pp. 32–33, 1941.

The *Actinomyces* recently isolated from soil at the New Jersey Agricultural Experiment Station and reported as antagonistic to other soil micro-organisms [*R.A.M.*, xx, p. 177] is named *A. antibioticus* n.sp. [without a Latin diagnosis] and referred to the chromogenic Actinomycetes, producing dark brown to black pigments in protein- or peptone-containing media. The active substance secreted by the organism, actinomycin, is highly pathogenic to (laboratory) animals. It forms orange-red crystals, soluble in ether, alcohol, and other organic solvents, but not in ether and only sparingly so in water, and is thermostable, resisting 30 minutes' boiling in neutral or slightly acid solutions.

Dennis (A. C.) & Dennis (R. W. G.). **Boron and plant life—part IV. Developments in agriculture and horticulture, 1939–40.**—*Fertil. Feed. St. J.*, xxv, 23, pp. 391–392, 394; 24, pp. 407–408, 410; 25, pp. 423–424, 426–427; 26, pp. 439–440, 6 figs., 1940; xxvi, 1, pp. 4–5; 2, pp. 15–17; 3, pp. 33, 35; 4, pp. 47, 49–50, 5 figs., 1941.

This is a review of research work carried out from the end of 1938 to the middle of 1940 on the problem of the boron requirements of plants [*R.A.M.*, xviii, p. 613], the two main aspects of which engaging the attention of workers having been the function of the element in the plant and the conditions under which it exists in the soil.

Burgess (A. H.) & Smith (G.). **Mould fungi as a possible cause of deterioration in stored Hops.**—*J. Inst. Brew.*, N.S., xxxviii, 3, pp. 53–55, 1941.

Under the Institute of Brewing Research Scheme a joint investigation was undertaken at the South-Eastern Agricultural College, Wye, Kent, and the London School of Hygiene and Tropical Medicine to determine the part played by moulds in the loss of preservative resins in commercially stored hops, and to ascertain the conditions of storage necessary to obviate such spoilage [*R.A.M.*, xv, p. 315]. Freshly picked hops were found normally to carry spores of a large number of moulds, an appreciable number of which survive drying, while further infection is apt to occur on the cooling floor, especially in windy weather. *Cladosporium herbarum*, a species commonly associated with aphid infestation and detected in the majority of green hop samples, was usually

completely eliminated by drying. The spores of various species of moulds were found to remain viable in stored hops for periods up to at least two years, but these are, of course, innocuous unless conditions favouring germination develop. Cases of actual mould growth on hops in the pocket are rare, and all those encountered during the present studies occurred on damp material.

Two experiments were conducted in which several hills of Fuggles hops were sprayed, a few weeks before picking, with aqueous suspensions of the two species of *Penicillium* most commonly observed on green hops, viz., *P. cyclopium* and *P. expansum*, the former alone being used in 1937 and both in 1938. *P. cyclopium* made vigorous growth on the sprayed bine cones in 1937 (a season of severe aphid attack), and analysis immediately after picking showed a decrease in α-resin from 7·3 to 5·3 per cent. and in preservative value from 10·8 to 8·5 per cent. compared with control samples from the same garden. In 1938, when aphids were much less troublesome than in the previous year, none of the sprayed hops showed any obvious signs of mouldiness at picking, and those inoculated with *P. cyclopium* gave no evidence of the presence of mycelium, nor were the spore counts significantly high. *P. expansum* made slight growth on the inoculated samples, and analysis revealed a slight but significant fall in the α-resin content from 6·2 to 5·4 per cent., corresponding to a decrease in preservative value from 9·5 to 8·6 per cent. Further experiments are obviously required.

In tests in a specially constructed chamber permitting of the exposure of relatively large hop samples to an atmosphere of constant humidity, with moisture contents up to 10 per cent. (a figure fairly representative of commercial storage conditions), no evidence of growth could be obtained with any of the 12 species of moulds used. In the presence of 12 per cent. moisture, two species of *Aspergillus*, *A. repens* and *A. ruber*, grew fairly well but did not reduce the preservative value of the treated samples. Pending further and more extensive experiments along these lines, it seems reasonable to conclude that the limit of safety for freedom from mould growth is not much below 12 per cent. moisture, so that under average storage conditions the organisms in question are not likely to constitute a serious source of deterioration.

Hesler (L. R.). **Notes on southern Appalachian fungi.**—*J. Tenn. Acad. Sci.*, xvi, 1, pp. 161–173, 9 figs., 1941.

This is a critically annotated list of 74 fungi collected during the past two years in eastern Tennessee and western North Carolina, among which may be mentioned *Sphacelotheca holci* and *Uromyces andropogonis* on *Sorghum halepense* (the latter verified by G. B. Cummins *in litt.* as a new host record), and *Pucoiniastrum americanum* on *Ribes strigosus* [ibid., xv, p. 250.]

Cooke (W. B.). **Additions to the host index of fungi of Mount Shasta, California.**—*Plant Dis. Reptr*, xxv, 2, pp. 61–62, 1941. [Mimeographed.]

A number of further records are added to the author's host index of fungi of Mount Shasta, California [*R.A.M.*, xx, p. 136], a few corrections in which have also been necessitated by subsequent investigations.

Smirnova (Mme. W. A.). **Die Abhängigkeit des Titers des Tabakmosaikvirus von den Ernährungsbedingungen der Pflanze.** [The dependence of the titre of the Tobacco mosaic virus on the nutritional conditions of the plant.] *Microbiology*, ix, pp. 182–187, 1940. [Russian. Abs. in *Chem. Zbl.*, cxi (ii), 14, p. 1885, 1940.]

In tomato plants grown in phosphorus- or nitrogen-deficient soil the titre of the tobacco mosaic virus was equal to, or higher than, that in plants receiving normal supplies of nutrient substances. However, despite the heavy accumulation of infective material the disease assumed only a mild form in plants deprived of phosphorus. Plants receiving an excess of nitrogen accumulated more of the virus than those from which this element was withheld.

Wenzl (H.). **Sclerotinia minor als Erreger einer Stengelfäule der Tomaten.** [*Sclerotinia minor* as the agent of a Tomato stem rot.]—*NachrBl. dtsch. PflSch Dienst*, xx, pp. 23–24, 2 figs., 1940. [Abs. in *Zbl. Bakt.*, Abt. 2, ciii, 6–8, p. 125, 1941.]

Tomatoes in Vienna market-gardens are stated to be subject to a stem rot caused by *Sclerotinia minor* and involving the whole plant in wilting, yellowing, and gradual necrosis. Sections through a diseased stem reveal numerous sclerotia and remnants of mycelium, which may also occasionally be observed on the exterior. So far the incidence of infection has only been sporadic.

Green (D. E.). **Hygiene in the war-time vegetable garden. V.**—*J. R. hort. Soc.*, lxvi, 5, pp. 168–173, 5 figs. (facing p. xliii), 1941.

Continuing his instructions on the care of war-time allotments [*R.A.M.*, xx, p. 238], the writer briefly describes the symptoms and discusses the control of damping-off (chiefly *Phytophthora parasitica*) [ibid., xx, p. 182], foot rot (*P. parasitica* and *P. cryptogea*), root rots of diverse origin, wilt (*Verticillium albo-atrum*) [ibid., xx, p. 93], leaf mould (*Cladosporium fulvum*), blight (*P. infestans*), and grey mould (*Botrytis cinerea*) of tomatoes.

True (R. P.). **Ceratostomella ulmi isolated from Elm wood of dish crates imported from England.**—*Plant Dis. Reptr*, xxv, 2, p. 55, 1941. [Mimeographed.]

Ceratostomella ulmi has recently been isolated in pure culture from elm wood used in the crating of dishes imported from England and intercepted at the Port of New York. In view of the ease with which the fungus may be carried in the round, half-round, or split uprights and side pieces, usually of green wood, composing the crates, efforts have been made to prevent the use of elm wood for this purpose.

Collins (D. L.), Parker (K. G.), & Dietrich (H.). **Uninfected Elm wood as a source of the bark beetle (Scolytus multistriatus Marsham) carrying the Dutch Elm disease pathogen.**—*Bull. N.Y. St. agric. Exp. Sta.* 740, 14 pp., 1 fig., 1940.

Up to 15 per cent. of the specimens of *Scolytus multistriatus* collected in the field in the south-east of New York State were found by culturing to be harbouring the Dutch elm disease pathogen, *Ceratostomella ulmi*

[*R.A.M.*, xx, p. 94 and preceding abstract]. When cultured immediately on emergence from diseased wood, as many as 100 per cent. of the beetles were positive for the fungus, but usually the average was well under 50 per cent.

When beetles artificially inoculated with spores were allowed to enter healthy wood, up to 74 per cent. of their progeny emerged carrying the spores of *C. ulmi*. Sound cut logs exposed to normal beetle infestation in the field produced up to 62 per cent. of insects positive for the fungus among the progeny of parents probably averaging much lower on entrance, while pieces of uninfected beetle infested wood collected in the open yielded as many as 25 per cent. of beetles carrying the elm parasite. 'Positive' beetles were also produced by diseased wood cut in short lengths and piled (16 and 9 per cent. stored out-of-doors and in sheds, respectively), the corresponding figures for healthy wood exposed to the ingress of spore-bearing insects being 14 and 19 per cent., respectively.

Out of 217 diseased trees inspected in 1939 in Ulster, Columbia, and Dutchess counties, representing the peripheral regions of the infected zone, 127 were shown to have contracted infection in the same year, and near 65 of these trees uninfected wood that had produced *S. multistriatus* in the spring or early summer was detected, suggesting a definite correlation of beetle emergence and feeding with the probable time of infection. From the fact that uninfected wood frequently produces spore-carrying beetles, it is argued that dead or dying elm wood of whatever origin, if suitable as a breeding-ground for the elm bark beetle, is a potential source of inoculum from which the fungus may be disseminated by the emerging progeny. It is evident, if this hypothesis be accepted, that such wood not only acts as a reservoir for the local spread of *C. ulmi*, but may also serve as a bridge for its transference to hitherto uninvaded areas.

Roth (E. R.). **Top rot in snow-damaged Yellow Poplar and Basswood.**—*J. For.*, xxxix, 1, pp. 60–62, 1941.

In June, 1939, yellow poplars (*Liriodendron tulipifera*), basswood (*Tilia glabra*), and other hardwoods (300 in all) at the Appalachian Forest Experiment Station, West Virginia, damaged by snow, in October, 1935, were examined for top rot in connexion with cordwood thinning studies. Most of the 27 per cent. injured *L. tulipifera* trees showed the presence of active decay in the stems. Nine out of 18 specimens of a soft, spongy, white rot of this host yielded *Collybia velutipes* [*R.A.M.*, xii, p. 44] (identified by R. W. Davidson), which usually involved the entire cylinder of heartwood, and in a few cases had penetrated the bole for a distance of 72 in. and induced discoloration to a depth of 90 in. The rot was found to extend about three times as fast down the stem as upwards, the area involved in discoloration being about twice as large as that actually decayed. Pure cultures of wood-decaying fungi could not be obtained from *T. glabra*, notwithstanding the presence of obvious rot in the stems.

Pirone (P. P.). **Bleeding canker of Maple in New Jersey.**—*Plant Dis. Reptr*, xxiv, 23, pp. 476–478, 1940. [Mimeographed.]

Bleeding canker due to a *Phytophthora* identified by C. M. Tucker as

P. cactorum [*R.A.M.*, xix, p. 570] was found by the author on a 25-year-old Norway maple [*Acer platanoides*] at Bernardsville, New Jersey, in October, 1940, this being the first record of the disease for that State. The most conspicuous symptom was a pinkish ooze emanating from some 20 bark fissures round the base. No pronounced canker was visible, but the inner bark was reddish-brown and appeared water-soaked when cut. The sapwood underlying the affected part was reddish-brown and had a deep olive-green margin. The discoloration extended to a depth of several annual rings. No effective control measures are yet known.

CAMPBELL (W. A.) & DAVIDSON (R. W.). **Red heart of Paper Birch.**—*J. For.*, xxxix, 1, pp. 63–65, 1 graph, 1941.

Torula ligniperda [*R.A.M.*, xix, p. 315] was isolated from 80 per cent. of the samples of red heart of paper birch (*Betula papyrifera*) in five plots in Massachusetts in 1937, and is thought to be one of the causes of the condition, which occurred in approximately equal amounts in seedlings and sprouts (rather more in the former). The defect was generally more prevalent in trees invaded by wood-rotting fungi than in sound ones, but in trees 50 years old it was present in practically all, regardless of condition.

LEDEBOER (M. S. J.). **Developments in pathological research on Wattles.**—*J. S. Afr. For. Ass., 1940*, 2, pp. 28–45, 5 figs., 1940.

From this tabulated discussion of the writer's studies on certain pathological conditions of wattles [*Acacia mollissima* and *A. decurrens*] in South Africa, it appears that no organism has been consistently isolated from the tissues of trees suffering from gummosis [*R.A.M.*, xix, p. 502], while inoculation experiments with *Bacterium acaciae* Greig Smith and *Diplodia natalensis* have so far given negative results. The same applies to the bark-grafting tests undertaken with a view to the detection of possible virus infection. Studies are now in progress to determine the effects of mineral deficiencies on wattles, and to ascertain the part played by nodule bacteria in the development of the seedlings under varying nutritional conditions.

No further progress has been made in the knowledge of the etiology of the 'Albert Falls' disease [loc. cit.].

Root collar rot [loc. cit] occurs in most plantations though seldom on so devastating a scale as the above-mentioned diseases. Affected trees show a blackening, cracking, and gumming of the bark at the base, decay of the root collar, and eventually are wind-thrown. The disease is associated with a fungus provisionally identified as *Rhizoctonia* which is prevalent in the early stages. Inoculation experiments are in progress.

GARREN (K. H.). **Fire wounds on Loblolly Pine and their relation to decay and other cull.**—*J. For.*, xxxix, 1, pp. 17–22, 1 graph, 1941.

Wood-rotting fungi [unspecified: cf. *R.A.M.*, xviii, p. 561] were found to be the most important agents of cull in loblolly pines (*Pinus taeda*) following fire injuries in Alabama, other contributory factors being the presence of large amounts of resin in the wood and insect

infestation. Of 2,703 felled trees in six localities, 16 per cent. showed one or more fire wounds, of which those measuring 7 to 12 in. in width might have been expected to result in considerable cull after 30 years, and those over 12 in. after ten.

Watson (Alice J.). **Studies of Botryosphaeria ribis on Cercis and Benzoin.**—*Plant Dis. Reptr*, xxv, 1, pp. 29–31, 1941. [Mimeographed.]

On rough, sunken, blackened, cankers on the branches and trunks of *Cercis canadensis* in Maryland, North Carolina, and Virginia was found a species of *Botryosphaeria* which is identified on the basis of morphological and cultural characters as *B. ribis* [var.] *chromogena* [*R.A.M.*, iv. p. 178]. Similar cankers on a single spice bush (*Benzoin aestivale*) in Maryland yielded the same fungus in the pycnidial (*Dothiorella*) stage only. Inoculations through wounds carried out by Lucia McCulloch with the fungus at the Beltsville (Maryland) Horticultural Station gave positive results, *B. ribis* var. *chromogena* being reisolated from the infected tissues.

Pirone (P. P.). **Canker of Red Bud in New Jersey.**—*Plant Dis. Reptr*, xxv, 3, pp. 95–97, 1941. [Mimeographed.]

Die-back of red bud (*Cercis canadensis*) in New Jersey is characterized by elliptical, sunken cankers, ½ to 2 in. in length, weakening and finally killing the branches. The fungus isolated from the diseased tissues forms a white, cottony aerial growth over a brownish-black substratum on potato dextrose agar. No spores have been produced to date but Miss Watson has referred the pathogen of red bud canker to *Botryosphaeria ribis* var. *chromogena* [see preceding abstract]. Inoculation experiments with fragments of agar containing the fungus on wounded and unwounded leaves, green shoots, or woody stems of *C. canadensis* and *C. chinensis* gave positive results in the case of injured surfaces only, the pathogen being reisolated from the diseased tissues. Pending further studies on control, the only advice that can be given is to cut back heavily cankered branches to the site of attachment to the trunk or larger branches, disinfecting all cut surfaces and applying a dressing of a good tree paint.

Secrest (H. C.), MacAloney (H. J.), & Lorenz (R. C.). **Causes of the decadence of Hemlock at the Menominee Indian Reservation, Wisconsin.**—*J. For.*, xxxiv, 1, pp. 3–12, 5 figs., 1941.

Although *Armillaria mellea* was present in an active form on eastern hemlock (*Tsuga canadensis*) trees found to be infested by the borer *Melanophila fulvoguttata* in the course of an investigation on the Menominee Indian Reservation (230,000 acres) in 1939, the heavy mortality among the stands during the past three years, involving 50,000,000 board ft. of merchantable saw timber, is attributed in the first instance to the severe and protracted drought prevailing in the experimental area from 1930 to 1937.

Strong (F. C.). **Root and butt rot in the Pinetum at Michigan State College.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxiii, 3, pp. 159–163, 4 figs., 1 diag., 1941.

In November, 1940, twelve white pine trees [*Pinus strobus*] in a

44-year-old plantation at East Lansing, Michigan, were partially or completely blown down by a gale and were found to have sustained severe infection by *Polyporus schweinitzii*. Four of the affected trees had snapped off from 6 in. to 3 ft. above ground-level and in one tree the heartwood was severely decayed to a height of over 10 ft. The evidence showed that spread had taken place from an affected tree to adjacent ones.

The available information indicates that more care should be used in selecting favourable sites for planting white pine, in order that stagnation of growth once the trees attain an age of 20 years or more may be avoided. Greater care in planting may also be advisable, to avoid producing 'soil-filled' pockets through which root infections may take place. From a purely silvicultural point of view, increase of vigour by thinning or fertilization would discourage spread to healthy trees but eradication of the diseased trees is not economically advisable. From an aesthetic point of view, it might be worth while to remove the affected trees, and treat the soil with carbon disulphide as for *Armillaria* root rot [*A. mellea*].

Christensen (C. M.). **Observations on Polyporus circinatus.**—*Phytopathology*, xxx, 11, pp. 957–963, 4 figs., 1940.

In north-western Minnesota the writer has observed *Polyporus circinatus* to be prevalent on white spruce (*Picea glauca*) and to occur occasionally on black spruce (*P. mariana*), Jack pine (*Pine banksiana*), balsam fir (*Abies balsamea*), and red pine (*P. resinosa*) [*R.A.M.*, ix, pp. 148, 628]. In 1937 several groups of up to 50 trees each were found in which as many as 50 per cent. bore fructifications of the fungus, but in the two years preceding and the two following 1937 only a few scattered fruit bodies were detected. Microscopically the fungus is characterized by brown, pointed setae arising from coloured hyphae in the pore wall. They ranged in length from 23 to 79 (average 44) μ and the average length of 50 spores in each of three fruit bodies was 4·7, 4·7, and 5·2 μ, respectively. The fungus makes good growth on malt or potato dextrose agar, producing a pale yellowish-brown to dark chocolate-coloured mycelium from which numerous chlamydospore-like enlargements develop after one to two months in culture. Evidence is adduced to establish the role of *Polyporus circinatus* as a primary cause of the premature stagnation and senescence, infecting trees 15 to 25 years old or even younger. The rotted wood shows the presence of pockets initiated most abundantly at the junction of the annual rings, but later distributed uniformly through the wood. All the wood elements are digested in the formation of the pockets and in the final stage of decay the wood is reduced to an interlacing network only.

Bramble (W. C.) & Holst (E. C.). **Fungi associated with Dendroctonus frontalis in killing Shortleaf Pines and their effect on conduction.**—*Phytopathology*, xxx, 11, pp. 881–889, 1 fig., 1 diag., 3 graphs, 1940.

A comprehensive, tabulated account is given of the writers' studies in North Carolina in 1932, 1934, and 1935 on the association of fungi with bark beetles, *Dendroctonus frontalis* (and *Ips* spp. in the later stages), in a widespread dying-off of shortleaf pines (*Pinus echinata*).

The organisms isolated on malt agar from cross-sectional blocks of the infested wood included *Ceratostomella pini*, *C. ips* [*R.A.M.*, xiv, p. 68], *Dacryomyces* sp., *Zygosaccharomyces pini* [ibid., xvi, p. 218], '*Monilia*' spp., *Trichoderma lignorum* [*T. viride*], and *Penicillium* spp., of which *Dacryomyces* sp., *C. pini*, and *Z. pini* may be termed 'primary invaders', gaining ingress to the bark within 24 hours of its tunnelling by the beetles and rapidly penetrating the sapwood, the heartwood being reached within a fortnight. These species are closely followed by '*Monilia*' spp. and *T. viride*, while the remaining fungi are restricted to the outer layers of sapwood. In inoculation tests, *C. pini* was the only one of the fungi capable of killing healthy trees from 2 to 6 in. in diameter at breast height, the corresponding measurement for *Dacryomyces* sp. being 1 to 2 in.; the other organisms gave negative results. Combined inoculations with different pairs of the fungi under investigation were no more effective than those with single organisms. The results of experiments, carried out by a method which involved following the course of a light green dye solution in the sapwood of severed stems inoculated with *C. pini*, *Dacryomyces* sp., *Z. pini*, and '*Monilia*' spp. showed that only the first-named is capable of extensive interference with the water conduction system, usually amounting to complete stoppage, the outer rings only being affected by *Dacryomyces*, while the other fungi were innocuous.

Craighead (E. C.) & St. George (R. A.). **Field observations on the dying of Pines infected with the blue-stain fungus, Ceratostomella pini Munch.**—*Phytopathology*, xxx, 11, pp. 976–979, 1940.

A table is presented showing the correlation of blue stain (*Ceratostomella pini*) of shortleaf pines [*Pinus echinata*] in Virginia in 1934 with infestation by the southern pine beetle (*Dendroctonus frontalis*) [see preceding abstract] during the previous year. On this occasion the insects were 'pitched out' and killed by the increased resin flow before they had time to construct their egg tunnels, and few reached the xylem, so that the blue-stain and wilting normally following rapidly on beetle invasion did not develop until the succeeding spring.

Spread of White Pine blister rust during the calendar year 1940.—*Plant Dis. Reptr*, xxv, 2, pp. 52–55, 1941. [Mimeographed.]

Details are given of new locations of blister rust (*Cronartium ribicola*) detected during 1940 on white pines or the alternate *Ribes* hosts [cf. *R.A.M.*, xviii, p. 562] in Virginia, West Virginia, Michigan, Minnesota, Iowa, Wisconsin, and California; in the last-named State the discovery of two infected sugar pines (*Pinus lambertiana*) in Shasta County (the first record for the locality) places the known southern limits of the rust about 107 miles south of the Oregon border [ibid., xviii, p. 3].

Toole (E. R.) & Buchanan (T. S.). **Little-leaf disease of Shortleaf and other southern Pines.**—*Plant Dis. Reptr*, xxv, 4, pp. 117–119, 1 map, 1941. [Mimeographed.]

Shortleaf pines [*Pinus echinata*], and to a lesser extent *P. taeda*, *P. australis*, and *P. virginiana*, have recently been observed to suffer from a disorder characterized by curtailment of the branch and twig

internodes, the foliage on which is very sparse and confined to the extremities. These symptoms are sometimes accompanied by chlorosis and shortening of the needles, marked reduction in the radial growth of the stem, and a progressive die-back of the crown from the base upwards. Only pole-size and larger trees are involved in this new trouble, the distribution of which extends roughly in a crescent-shaped belt from central Virginia southwards through western North and South Carolina and thence westerly across north-central Georgia and Alabama to north-eastern Mississippi, while a few cases have also been reported from Tennessee and Texas. In some districts the actual or anticipated mortality from little leaf has been sufficient to warrant abnormally heavy cutting of *P. echinata*, the continued use of which for planting programmes in areas within the range of the disease is further under discussion by certain agencies.

Strong (F. C.) & Cation (D.). **Control of Cedar rust with sodium dinitrocresylate.**—*Phytopathology*, xxx, 11, p. 983, 1940.

Teleutospore germination from the rust galls of *Gymnosporangium juniperi-virginianae* and *G. globosum* on red cedar (*Juniperus virginiana*), and of *G. clavipes* and *G. clavariaeforme* on dwarf juniper (*J. communis*) [*R.A.M.*, xx, p. 23] was inhibited at the Michigan State College by the application to one group of trees on 8th May, and to another on the 16th, of 1 per cent. sodium dinitrocresylate (elgetol) [ibid., xx, p. 212]. The red cedars contracted no foliar injuries as a result of the treatment, which caused slight damage, however, to some badly infected dwarf junipers. The galls produced by *G. globosum* predominated on *J. virginiana*, up to 8,000 or 12,000 per tree being counted. On the sprayed portions of the trees the extension of the teleutosori came to a total standstill, while proceeding unchecked on the untreated upper parts. Elgetol is considered to be the most promising of the fungicides yet tested against the teleuto stage of the *Gymnosporangium* rust fungi and gives a new method of attack for the control of these fungi on Pomaceous hosts.

Hahn (G. G.). **New reports on Adelopus gäumanni on Douglas Fir in the United States.**—*Plant Dis. Reptr*, xxv, 4, pp. 115–117, 1941. [Mimeographed.]

Since the publication of Boyce's critical study of the needle cast (*Adelopus* [*Phaeocryptopus*] *gaeumanni*) on Douglas fir (*Pseudotsuga taxifolia*), in which information was presented concerning the distribution of the disease in the United States [*R.A.M.*, xix, p. 736], news has been received of its occurrence in a number of fresh localities in Connecticut, Maine, Massachusetts, New Hampshire, New York, Washington, Oregon, California, New Mexico, and Arizona.

Zucker (M.). **X-ray pole inspection a new engineering tool.**—*Elec. World, N.Y.*, cxiii, 12, pp. 33–35, 108–109, 7 figs., 1 graph, 1940.

The development of the technique for the X-ray inspection of electric distribution and transmission poles [*R.A.M.*, xx, p. 284] at the Detroit (Michigan) Edison Company is described, the method finally adopted being that of 'non-screen' radiography, the rays emerging from the pole

registering directly on specially sensitized films wrapped in light-proof paper. For field work the apparatus, a Westinghouse 'Diadex' machine, 85 kv., 15 milliamp. anode current, is mounted on a sliding shelf in a spring-supported cabinet near the tailboard of a pick-up truck, power being supplied by a 2 kw. 'Homelite' two-cylinder, air-cooled gasoline engine and single-phase, self-excited generator with 110 volts, 50 cycles, placed on coil springs behind the truck cab. In the matter of interpretation of the films, the structure of the fibre was found to be a better indicator of the condition of the wood than film density, sound material having precise, smooth-flowing boundary lines, which begin to waver and separate, slightly but unmistakably, as soon as decay starts to impair strength. The higher cost of X-ray inspections as compared with boring and probing tests has been justified by the saving in pole replacements, and the satisfactory degree of accuracy achieved by the new technique was verified in trials on northern cedar [*?Thuja occidentalis*] poles.

WALKER (J. C.). **Origin of Cabbage black rot epidemics.**—*Plant Dis. Reptr*, XXV, 3, pp. 91–94, 1941. [Mimeographed.]

The increasing economic importance of cabbage black rot (*Bacterium campestre*) [*Pseudomonas campestris*] is attributed largely to neglect of fundamental precautionary measures, including seed treatment [*R.A.M.*, XX, p. 239] in hot water, crop rotation, and seed-bed sanitation to eliminate the organism from diseased refuse, in which it may persist for at least a year; the symptoms due to early infections from this source may be masked during the cool initial stages of the growing period and thus escape attention until the development of active outbreaks with rising temperatures about heading time. In 1940 the disease was very severe in Wisconsin both on cabbage and cauliflower, causing 50 per cent. losses in many fields, while one 10-acre cabbage crop was a total failure. An untreated lot of Danish-grown Bugner seed produced infected plants, whereas adjacent stands raised from Puget Sound stock [loc. cit.] remained healthy. Cabbage plants transported from the south constitute a common source of infection in northern areas.

GODFREY (G. H.). **An outbreak of Cabbage black spot disease in the Lower Rio Grande Valley of Texas.**—*Plant Dis. Reptr*, XXV, 4, pp. 119–120, 1941. [Mimeographed.]

Black spot (*Alternaria brassicae* (Berk.) Sacc.) [used for *A. oleracea*: *R.A.M.*, vi, p. 202], which has been observed annually in a mild form on cabbage for the past four years in the Lower Rio Grande Valley of Texas, developed with extreme severity for the first time in the State early in the season of 1941, following abnormally heavy rains in December and January, reducing yields from the customary figure of 15 tons per acre to 3 or less. Taking 90 to indicate plants with the lower leaves spotted, 80 those with clean wrapper leaves but outer leaves considerably spotted, and so on, the average figures for eight varieties, based on individual records of 100 to 600 plants of each, were as follows: Allhead Select 68, Wisconsin Allseason 68, Globe 67, Penn State Ballhead 66, Midseason Market 60, Marion Market 59, Hollander 58, and Round Dutch 42.

Below 60 plants were totally unmarketable, while even 70 was doubtful owing to the presence of a few spots on the wrapper leaves.

Борьба с вредителями и болезнями Сахарной Свеклы. [Control of pests and diseases of Sugar Beet].—*Ex* Основные выводы научно-исследовательских работ ВНИС за 1938 год. [Main results of the scientific research work during 1938 of the Pan-Soviet Scientific Research Institute for the Sugar Industry (VNIS)], pp. 148–170, 5 figs., 2 diags., 1940.

In this collection of papers, arranged on similar lines to those of the previous year [*R.A.M.*, xix, p. 321], the following items are of interest.

Mme. N. I. Salunskaya (pp. 162–163) states that Bordeaux mixture applied twice before and twice after the appearance of spots on the foliage reduced the field infection of sugar beet by *Cercospora* [*beticola*: loc. cit.] from a 1·24 to a 0·48 mark. Under conditions of very slight infection prevailing during 1938, the increase in yield resulting from three to four sprays of Bordeaux mixture amounted on the average to from 5 to 7 per cent. Field observations showed that the first spray is most effectively applied when the first lesions appear on the leaves, and that sprays should not be applied after sudden, transient rains which are usually followed by reduced atmospheric humidity, but rather after a period of prolonged wet weather lasting at least two to three days.

A. L. Bouznitzky's (pp. 164–165) biochemical studies showed that in leaves of sugar beets severely affected by *C. beticola* the peroxidase activity was about 1½ times to twice that of those only slightly affected, and that the latter had a higher content of total, soluble, and albuminous nitrogen, and a lower content of oxalic acid, particularly in insoluble form.

Mme. N. I. Salunskaya (pp. 165–166) states that the formation of spores of *C. beticola* on leaves of sugar beet in the laboratory occurred at a relative humidity of above 90 per cent. and a temperature not below 9° C. Under optimum conditions of atmospheric humidity (97 to 100 per cent.) and temperature (25° to 28°), the spores formed within 15 to 17 hours, this period being much extended when the humidity and temperature were lowered. At low humidity, no conidia were formed on the lesions, whereas at high humidity conidiophores were produced after 10 hours.

K. I. Vitas (pp. 166–167) found that of the fungi causing storage rot of sugar beet [ibid., xix, p. 322], *Rhizopus* sp. is more suitable for use in resistance tests than *Botrytis cinerea*, as the latter tends to deteriorate and to lose its virulence in culture. *Rhizopus* sp., on the other hand, maintained its virulence, rapidly spread over the medium in the Petri dish, was not contaminated by other micro-organisms during the period of the test, and finally infected the plant material at a temperature of 20° to 22° so rapidly as to reduce the duration of the whole analysis by about half as compared with the *B. cinerea* tests. *Fusarium culmorum* [loc. cit.] did not deteriorate in culture, but developed more slowly than *B. cinerea* and was therefore often contaminated by other micro-organisms. Decayed beet heart should not be used in analysis owing to the varying infection by micro-organisms.

N. I. Gomolyako (pp. 167–168) gives a preliminary description of a

method for the identification of spores of *Uromyces* spp. encountered in beet seed samples. The method consists in heating to boiling point spore preparations to which strong concentrations of caustic potash have been added; this results in a swelling of the spore walls followed by their characteristic splitting into layers. In spores of *U. betae* [ibid., xv, p. 400] the walls split into one thin inner and two outer layers, of which one was light- and the other dark-coloured; in spores of *U. pisi* and *U. rumicis* no splitting occurred, but the unevenness of the surface became accentuated; in spores of *U. trifolii* the effect on the outer layer was noticeable only at the top of the spore; in *U. fabae* the splitting was analogous to that in *U. betae*, while none was observed in *U. polygoni*.

A. Y. Ovtcharenko (pp. 168–169) states that the chief source of spring infection by *Peronospora* [*schachtii*: ibid., iv. p. 391] are diseased transplants; in 1938 diseased mother roots produced over 90 per cent. of diseased transplants. When sown near transplants, beets showed the highest proportion of infection at a distance of from 5 to 20 m., a small percentage still occurring at a distance of 500 m., but none at 1,500 m. Sowings should, therefore, not be made at a lesser distance than 1,500 m. from the transplants. In inoculation experiments infection resulted only from freshly gathered diseased leaves. The incubation period lasted for 5 to 14 days.

I. M. Krasnoshtshekoff and N. A. Ryakhovsky (p. 169) sum up the results of several years' tests for the control of *Ascochyta* [unspecified] in beets by the thermal method of seed treatment as follows. The best results were obtained by heating the seed for five minutes in hot water (50°) after pre-soaking it for 4½ hours in 25 per cent. water and 2 per cent. ethyl alcohol [? in proportion to the weight of seed]. Seeds thus treated showed the same amount and energy of germination as the untreated control lot, but the percentage of infection was reduced to between 0 and 2 as against 46. The importance of drying the seed after treatment thoroughly and quickly (within one to two days) is stressed, since it was found that poor stands were due to sowing moist seeds.

N. I. Gomolyako (pp. 169–170) gives the results of tests conducted in 1939 with a 'Jaeger' machine used for drying beet seeds treated with formalin against seed-borne diseases such as rust [*Uromyces betae*] and *Peronospora* [*schachtii*]. The machine had several minor disadvantages, but it was possible to dry in it formalin treated seeds of a humidity of 50 to 74·3 per cent. without preliminary drying, although very moist seeds had to be put through the machine several times. When dried at a temperature of 50° the seeds showed a germination of 91 per cent. as compared with 93 in the untreated control, while at higher temperatures (70° to 80°) the percentage was reduced to 72.

Reinboth (G.). **Die Cercosporabekämpfung bei den Rüben.** [*Cercospora* control in Beets.]—*Zuckerrübenbau*, xxiii, 1, pp. 10–12, 1941.

Great difficulty has been experienced in persuading Italian farmers to take any active steps for the control of leaf spot of sugar beets (*Cercospora beticola*) [*R.A.M.*, xvi, p. 362], especially in view of the rarity of severe epidemics of the disease and the tendency of mild attacks to increase rather than depress the sugar content. Spraying is now being

conducted with materials containing little or no copper but with the addition of citrus fruit essences, but attempts to combat the leaf spot along these lines have been very half-hearted, and the prospects of an energetic campaign against the pathogen are not encouraging. For a time interest was aroused by the resistant late-maturing varieties, which failed to hold their ground, however, against the superior commercial attractions of a 'bumper' summer harvest.

NEUWEILER (E.). **Neue Versuche über die Wirkung des Bors auf einige Feldgewächse.** [Further experiments on the action of boron on certain field crops.]—*Annu. agric. Suisse*, liv, 9, pp. 916–935, 1 fig., 1940. [French summary.]

The writer fully describes and tabulates the results of his further trials at the Federal Agricultural Experiment Station, Oerlikon, Zürich, from 1936 to 1938 to determine the value of boron in the control of heart rot of beets [*R.A.M.*, xv, p. 696] and its effects on swedes, potatoes, and celery. The outcome of the previous tests was fully confirmed, the beets treated with boric acid at doses of up to 12 kg. per ha. remaining healthy, while those receiving complete fertilizers from which the trace element was omitted contracted 75 to 100 per cent. heart rot. Chile saltpetre, which contains minute amounts of boron, failed to exert a definitely curative action on heart rot but proved to be a more suitable nitrogenous constituent of the complete fertilizer than synthetic sodium nitrate. The beneficial effects of boron treatment on swedes, Flava and Ackersegen potatoes, and celery were reflected in improved quality and heavier yields.

WHIPPLE (O. C.) & WALKER (J. C.). **Strains of Cucumber mosaic virus pathogenic on Bean and Pea.**—*J. agric. Res.*, lxii, 2, pp. 27–60, 15 figs., 1941.

In the course of studies in Wisconsin from 1935 to 1939 a virus affecting peas and another attacking both peas and beans were observed in nature. Both viruses were found to belong to the cucumber mosaic group and are referred to as strains 14 and 17 of that group. In greenhouse experiments strain 14 infected all 25 strains of bean (*Phaseolus vulgaris*) and the three varieties of pea tested with some varietal differences in the symptoms. Generally, the early symptoms produced by strain 14 on bean included the range described for both bean virus 1 and 2, but the drooping of the unifoliate leaves distinguished it from bean virus 2 and epinasty of the first trifoliate leaf from bean virus 1. Stunting, which becomes greater with age, was the most constant of the symptoms, others being an irregular glossy leaf surface, vein-clearing of younger leaves, and some necrosis or mottling. Masking of leaf symptoms in the greenhouse and field was commonly observed. On peas strain 14 produced first a wilting with necrosis or mottling, eventually causing premature death [cf. *R.A.M.*, xix, p. 561]. Strain 17 infected none of the beans tested while on all the three pea varieties it produced symptoms closely resembling those caused by strain 14 but with a more pronounced stem necrosis and showing vein-clearing of the young leaves more commonly than mottling. Neither cucumber virus 1 nor celery virus 1 produced systemic infection in the bean varieties, and only local symptoms in a few pea plants. Three substrains of 14 were

isolated, a 'yellow', a 'dark green', and a 'normal green' which produced distinct symptoms on tobacco, cucumber, bean, pea, and cowpea.

The most typical symptoms of strain 14 on peas and beans developed at 24° C. although the disease was most severe at 28°; at 16° all symptoms except epinasty and stunting were completely masked in bean leaves. The properties of strains 14 and 17 agreed in general with those described for other cucumber mosaic viruses. The thermal inactivation point (after 10 minutes' exposure) was about 65° for strain 14 and between 65° and 70° for 17. Both strains remained infectious *in vitro* for 7 to 8 days at 20° to 22°. The maximum dilution at which infection occurred was 1 in 1,000 for strain 17 and 1 in 10,000 for 14. Both strains were readily transmitted by *Myzus persicae* to and from several hosts, the incubation period in which ranged from 14 to 21 days. Mechanical transmission was also achieved with or without the use of carborundum powder as an abrasive. Strain 14 was not transmitted to the 580 pea and 440 bean seedlings grown from infected seed; no seed transmission trials were made with strain 17.

In comparative host range studies with cucumber virus 1 [ibid., vi, p. 501], and celery virus 1 [ibid., xiv, p. 4] [the results of which are fully tabulated] involving 19 species of plants belonging to 16 genera of 6 families, both strains infected all plants susceptible to cucumber virus 1 and, in addition, strain 14 infected Lima bean (*P. lunatus*) and both attacked yellow sweet clover (*Melilotus officinalis*). Strain 17 differed from cucumber virus 1 only in causing systemic infection in pea, *Datura stramonium*, and *M. officinalis*. The symptoms produced by strains 14 and 17 were in some hosts similar to those produced by cucumber virus 1, while in others certain differences were evident. The host range of strain 14 closely agreed with that of celery virus 1, but each virus infected several hosts not infected by the other. None of the four viruses tested was able to infect White Dutch clover (*Trifolium repens*) or soybean. Preliminary tests seemed to indicate that zinnia plants infected by strain 14 are immune from other strains of cucumber mosaic virus, thus demonstrating its place in the cucumber mosaic group.

It is stated that strains 14 and 17 may be separated from mixtures with bean viruses 1 and 2, and pea viruses 1, 2A, 2B, and 2C by inoculation to either tobacco or tomato, and vice versa that any one of the five last named viruses can be isolated by transfer to broad bean. The strains 14 and 17, cucumber virus 1, and celery virus 1 cannot be completely separated from one another when present in admixture, except in certain combinations. Thus strain 14 can be isolated from any of the others by inoculation into kidney bean, cowpea, or Fordhook Mammoth Pod Lima bean; strain 17 cannot be separated from a mixture with strain 14, but can be isolated from the other two by inoculation to garden pea or yellow sweet clover; celery virus 1 can be freed from the other three by inoculation to broad bean (*Vicia faba*), but cucumber virus 1 cannot be separated from the others by the methods employed.

KREUTZER (W. A.), BODINE (E. W.), & DURRELL (L. W.). **Cucurbit diseases and rot of Tomato fruit caused by Phytophthora capsici.**—*Phytopathology*, xxx, 11, pp. 972–975, 1 fig., 1940.

An account is given of investigations to date, mainly in Colorado, on

the decay of cucumber and tomato fruits and the wilt of squash (*Cucurbita maxima*) and watermelon vines caused by the agent of chilli blight (*Phytophthora capsici*) [see above, p. 317]. All the diseases are of a serious nature and have been responsible for heavy losses among the affected crops of recent years. The fungus was isolated from each host and experimentally shown to be pathogenic.

HOWARD (J.). **'Hooded' boom for Grape spraying.**—*Amer. Fruit Gr.*, lxi, 2, p. 13, 3 figs., 1941.

A specially constructed spray boom fitted with a hood to facilitate the application of black rot [*Guignardia bidwellii*] treatments in the eastern United States is briefly described. The contrivance has been found specially useful in the later stages of growth, when the drift from sprays directed upwards to the dense roof of foliage is apt to blow away from the rows, tending to leave some vines without complete coverage to act as 'pockets' of re-infection, besides causing discomfort to the operator. The hood confines the drift and breaks the wind, coverage being ensured by correct nozzle adjustment, pressure, and rate of travel through the vineyards.

Service and regulatory announcements October–December, 1940. Plant quarantine import restrictions, Republic of Chile. List of current quarantine and other restrictive orders and miscellaneous regulations.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 145, pp. 86–101, 1941.

A revised digest, dated 1939, of the plant quarantine import restrictions obtaining in the Republic of Chile from 1925 to 1938, is presented, and includes, *inter alia*, Decree No. 30 of 28th April, 1931, prohibiting the importation of potatoes from foreign sources as a means for the exclusion of wart disease (*Chrysophlyctis endobiotica*) [*Synchytrium endobioticum*], and a Decree [unnumbered] of 31st January, 1939, of which article 1 prohibits the sowing of wheat infected by loose smut (*Ustilago tritici*), and article 7 enacts that consignments of wheat imported for seed must be accompanied by a duly authenticated certificate vouching for the cultivation of the crop in localities free from the disease in question.

A summarized list is given of current domestic (continental United States, Hawaii, and Puerto Rico) and foreign orders and regulations.

Service and regulatory announcements. List of intercepted plant pests, 1938–9.—*S.R.A., B.E.P.Q., U.S.Dep. Agric.*, 53 pp., 1940.

Lists are given of pests and diseases intercepted on plants or plant products entering the United States during the period from 1st July, 1938, to 30th June, 1939. Among the phytopathological interceptions of economic importance are four of citrus canker (*Bacterium* [*Pseudomonas*] *citri*) found on limes from Java and the Straits Settlements, on grapefruit from India, and on an orange of unknown origin in baggage from Canada, one of white pine blister rust (*Cronartium ribicola*), three of citrus black spot (*Phoma citricarpa*), and 360 of Lima bean [*Phaseolus lunatus*] scab (*Elsinoe phaseoli*).